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U. S. DEPARTMENT OF THE INTERIOR
PROTOTYPE OIL SHALE LEASING PROGRAM

OIL SHALE TRACT C-b
ENVIRONMENTAL MONITORING REPORT
(June 1982 through December 1982)

Submitted to:

Mr. Eric G. Hoffman
Deputy Minerals Manager for Oil Shale
Oil Shale Office
USDI Minerals Management Service
131 Nth 6th Street - Suite 300
Grand Junction, Colorado

By:

CATHEDRAL BLUFFS SHALE OIL COMPANY

TENNECO SHALE OIL COMPANY
OCCIDENTAL OIL SHALE, INC.

January 15, 1983

VOLUME NUMBER

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2.5 Biology

Studies required by the Interim Monitoring plan are contained in this section and are listed in the table of contents.

Several biology monitoring stations were discontinued during the Interim Monitoring Program. Table 2.5-1 presents a list of stations to be continued during this phase.

Monitoring stations referenced in this section are located on Figure 2.5-1, Biological Development Monitoring Program.

All monitoring stations are referenced by four-digit computer station codes. A cross-reference of the computer codes and station ID appear in section 4.0 (Data Automation).

TABLE 2.5-1

BIOLOGICAL MONITORING PROGRAM DURING THE INTERIM PHASE

Programs	General Location	Computer Code		
Deer Mortality	North Side of Piceance Creek	BD01		
		BD02		
		BD03		
		BD04		
		BD05		
		BD06		
	South Side of Piceance Creek	BD07		
		BD08		
		BD09		
		BD10		
Deer Age Class	General Area of Tract	BF01		
Lagomorph Abundance	Identical Locations to Deer Pellet Group Densities	BA01 to BA49		
Small Mammals	Piceance Creek (Development)	BG01		
	On-Tract-West	BG02		
	Piceance Creek (Control)	BG03		
	On-Tract-East	BG04		
	Sprinkler Area Section B	BG05		
	Sprinkler Area (Control)	BG11		
	Sprinkler Area (Development	BG22		
	Sprinkler Area (Control)	BG33		
Raptors	The Entire Tract and Surrounding Study Areas.	BI01		
Aquatic Ecology				
Benthos	USGS 09306007 (Control)	WU07		
	USGS 09306058 (Development)	WU58		
	USGS 09306061 (Development)	WU61		
Periphyton	Piceance Creek Upstream (Control)	WP01		
		WP02		
	Piceance Creek Downstream (Development)	WP03		
Water Quality	USGS 09306061 (Development)	WU61		
Vegetation				
Community Structure	Plots	*	**	***
	Chained pinyon juniper (1978)(Dev)	BJ01	BJ11	BJ21
	Chained pinyon juniper (1978)(Cont)	BJ02	BJ12	BJ22
	Upland sagebrush (1980)(Cont)	BJ03	BJ13	BJ23
	Bottomland sagebrush (1980)(Cont)	BJ04	BJ14	BJ24
	Pinyon juniper woodland (1979)(Dev)	BJ05	BJ15	BJ25
	Pinyon juniper woodland (1979)(Cont)	BJ06	BJ16	BJ26

* Fenced (8'high) - Used for Community Composition and Structure
** Open
*** Fenced (4'high) - Used for Herbaceous Productivity and Utilization.

TABLE 2.5-1 (CONT)

Deer Pellet Group Densities

Vegetation Type	Location	Treatment	Transect (Computer Code)
CPJ	Off Tract	Control	BA01
			BA02
			BA03
			BA04
			BA05
			BA06
			BA07
			BA08
			BA09
	On Tract		BA17
			BA18
			BA25
			BA28
			BA29
			BA30
			BA31
CPJ	On Tract	Development	BA32
		Sprinkler	BA20
		Development	BA21
			BA23
PJ	Off Tract	Control	BA13
			BA14
			BA15
		Development	BA10
			BA11
			BA12
			BA16
	On Tract	Control	BA19
			BA26
			BA27
		Development	BA22
			BA24
Brush Beaten* SB	Off Tract	Development	BA41
			BA42
			BA43
			BA44
			BA45
			BA46
			BA47
			BA48
			BA49

Program	General Location	Computer Code
Micro Climate	MC Sta. 1	BC01
	2	BC02
	3	BC03
	4	BC04
	5	BC05
	6	BC06
	7	BC07
	8	BC08
	9	BC09
	13	BC13
Traffic Count	Rio Blanco Store	BT01
	South of Cattle Guard	BT02
	Rio Blanco Lake	BT03

TABLE 2.5-1 (CONT)

Herb Productivity and Utilization: Same locations as community structure plus the following:

1) Range Cage Averages:

Vegetation Type	Computer Code	
	Outside Cages	Inside Cages
CPJ	BK01	BK11
US	BK03	BK13
BS	BK04	BK14
PJ	BK05	BK15

2) Topsoil Piles:

Location	Computer Code
#12-West of Mine Support Area (Seeded in 1978)	BP01

3) Brush Beating Areas:

Oldland Gulch	BU01
Gardenhire Gulch	BU02
Control	BU03

4) Irrigation/Fertilization Treatment Areas:

Computer Code	Treatment Number	Years Fertilized	Fertilized Rate Lbs/Acre	
			N	P
BL11	1a	Not Fertilized		
BL21	1b	Not Fertilized		
BL31	3a1	1980	100	100
BL41	3b1	1980	100	100
BL51	4a1	1980	200	100
BL61	4b1	1980	200	100
BL32	3a2	1980, 1981	100	100
BL42	3b2	1980, 1981	100	100
BL52	4a2	1980, 1981	200	100
BL62	4b2	1980, 1981	200	100
BL80-Open Areas		Not Fertilized		
BL81-Closed		Not Fertilized		

Shrub Productivity and Utilization:

Browse (Bitterbrush) Production & Utilization
77-78, 78-79, 79-80, 80-81

Vegetation Type	Location	Treatment	Transect (Computer Code)
CPJ	Tract C-b	Control	BA17
			BA18
			BA25
			BA30
		Development	BA21
			BA23
		Development, Sprinkler	BA20
		Irrigation	BA32
	Big Jimmy Ridge	Control	BA19
			BA04
			BA06
			BA09
PJ	Tract C-b	Control	BA19
			BA26
			BA27
		Development	BA16
			BA22
			BA24

General Condition:

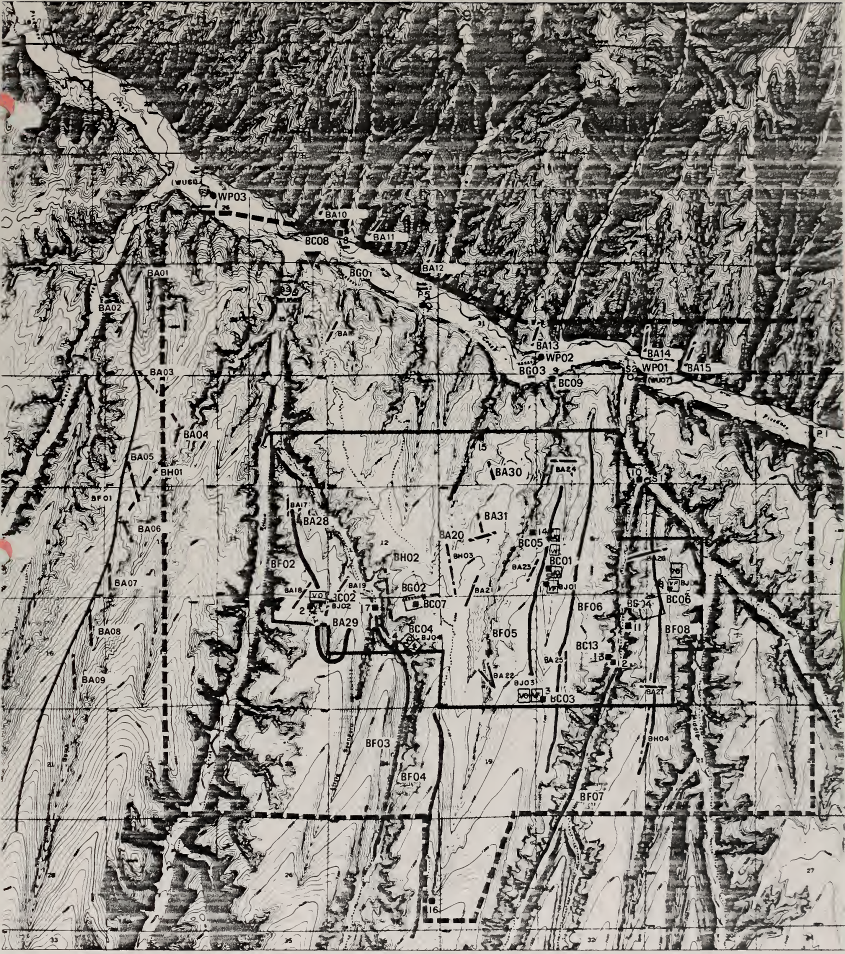
By Landsat over selected Tract areas - not in computer data base; discontinued during Interim phase.

TABLE 2.5-1 (CONT)

Biology (Cont'd)

Programs: Deer Distribution & Migration and Road Kills

Mile Marker	Location	Computer Code	
		North & East of Piceance Creek Road	Meadows; South & West of Piceance Creek Road
41	White River City	BN41	BM41
40	Piceance Bridge	BN40	BM40
39	Lower Canyon	BN39	BM39
38	Piceance Canyon	BN38	BM38
37	Yellow Creek	BN37	BM37
36	Stinking Springs	BN36	BM36
35	Old Bridge	BN35	BM35
34	Little Hills Turnoff	BN34	BM34
33	Old Corrals & Buildings	BN33	BM33
32	Burk Ranch	BN32	BM32
31	Ranch	BN31	BM31
30		BN30	BM30
29		BN29	BM29
28	Bureau of Mines	BN28	BM28
27	Ryan Gulch	BN27	BM27
26	Pump Station	BN26	BM26
25		BN25	BM25
24	Rock School	BN24	BM24
23	AQ 021	BN23	BM23
22	Pat Johnson's Ranch	BN22	BM22
21	Hunter Creek	BN21	BM21
20	PL Gate	BN20	BM20
19	AQ 020	BN19	BM19
18	Sorghum, Cottonwood	BN18	BM18
17	Stewart Gulch Rd.	BN17	BM17
16	AQ Trailer 022	BN16	BM16
15	Oldland's Ranch	BN15	BM15
14	Oldland's Ranch	BN14	BM14
13	Pond and Cabin	BN13	BM13
12	Sprague Gulch	BN12	BM12
11	Cascade Gulch	BN11	BM11
10	13 Mile Gulch	BN10	BM10
9	14 Mile Gulch	BN09	BM09
8	Schutte Gulch	BN08	BM08
7	Robinson's Ranch	BN07	BM07
6		BN06	BM06
5	2 Old Cabins (35 MPH Curve)	BN05	BM05
4	McCarthy Gulch	BN04	BM04
3	Cow Creek	BN03	BM03
2	Mahogany Outcropping	BN02	BM02
1	Woodward Ranch	BN01	BM01
0	Rio Blanco Store	BN00	BM00


WU60
WP03
BA10
BA11
BC08
BG01
BA12
BA01
BA02
P5
BA13
WP02
BG03
BC09
BA14
S2
WP01
WU07
BA15
P1
BA03
BA04
BA05
BH01
BF01
BA06
BA07
BA08
BA09
BA17
BA28
BF02
BA18
VO
BC02
BJ02
BA19
BA29
BH02
BG02
BC07
BC04
BJ04
BA30
BA31
BA20
BH03
BA21
BA23
BA24
BC05
BC01
BJ01
VF
BF05
BF06
BA22
BJ03
BC03
BA25
BC13
BG04
BA26
BC06
BF08
BA27
BH04
BF03
BF04
BF07
16

(GS) Water Gaging Station - Benthos

VO / VF Vegetation Site: VO = Open (50 x 70 m) VF = Fenced (50 x 70 m)

■ Microenvironmental Station

○ Fish Sampling

● Periphyton

·············· Animal Trap Site

— — — Deer Pellet and Browse Utilization Transects

— · — Ornithological Gamebird Study Transects

—— Predator Survey Lines

▼ Other Sensitive Areas

I II-

BIOLOGICAL
DEVELOPMENT
MONITORING
PROGRAM

Figure 2.5-1

2.5.1 Terrestrial Wildlife Studies

Data were collected in summer 1982 for deer migrational patterns and phenology, road kills, natural mortality, browse production and utilization studies, lagomorph abundance, small mammal populations, and raptor nesting.

2.5.1.1 Big Game: Mule Deer

2.5.1.1.1 Deer Pellet Group Densities

Thirty-nine deer pellet transects of 20 - 0.01 acre plots each were sampled in the summer of 1982. Locations of the transects are shown on Figure 2.5-1 (designated as BA$$). Eighteen transects were sampled in chained rangeland areas, 12 were sampled in pinyon-juniper woodland, and 9 were sampled in brush-beaten sage areas. A tabular summary of pellet-group data for 1981-82 is presented in Table 2.5.1.1-1.

Results of mule deer pellet-group counts for 1981-82 will be discussed as three topics: 1) a general, non-quantitative, impact evaluation of Tract C-b development activities over the past five years; 2) a quantitative analysis of a local impact, discussed primarily to illustrate one of several analytical procedures; and 3) an evaluation of the present success of the brush-beating mitigation program.

Figures summarizing deer pellet-group monitoring data (Figures 2.5.1.1-1 and -2) have been modified this year to accomodate the expanding data base, and to better portray long-term patterns and trends. Transect designations have been ordered from low to high on the basis of mean pellet-group density estimates over the past five years. The figures have been designed to make the following features conspicuous should they occur: 1) a trend toward lower values at transect locations close to development activities, accompanied by a possible trend toward higher values at control areas (indicative of a permanent displacement of deer from areas near development); 2) a temporary shift toward lower values at localized disturbance sites (indicative of short-term displacements); 3) returns to previous density values following localized impacts (indicative of habituation to disturbances); and 4) any consistent pattern in the data that provides insight into the manner in which deer use the area on a year-to-year basis.

An impact evaluation of development activities on the local mule deer population over the past five years can be performed in a general way by examination of Figures 2.5.1.1-1 and -2. A dashed line has been drawn to connect data points of the first year, the winter of 1977-78; this year is baseline in that major development activities began during the summer of 1978. A solid line has been drawn through 1981-82 data points merely to highlight this past year. Transect locations originally defined as "development" (in contrast to "control") are circled along the x-axes of both figures. The original development designation was retained to indicate those transects that are in close proximity to major construction activities. Using this criterion of development-control sites, it is clear that deer pellet-group densities have not declined since 1977-78 at the development locations. In addition, there is no indication of a yearly trend toward higher values at control locations.

The original designations of development and control transects must necessarily change in certain years, however, since unanticipated disturbances sometimes occur. For example, a drill rig was operating between transects BA06 and BA07 from September 1981 to April 1982. Because of noise and visual disturbances, it was considered likely that wintering deer might be temporarily displaced from the immediate vicinity. This hypothesis was tested mainly to evaluate the sensitivity of deer pellet-group monitoring data in terms of its usefulness in detecting localized impacts. Thus, the purpose of the following discussion is to illustrate an analytical procedure, not to provide an argument that an impact of some

TABLE 2.5.1.1-1

Deer pellet group densities, 1981-82.

Transect	Mean pellet groups per .01 acre plot +/- SE (n)*
Chained rangeland:	
BA17	1.60 +/- 000.33(20)
BA18	4.20 +/- 000.64(20)
BA25	4.90 +/- 000.61(20)
BA20	7.75 +/- 001.06(20)
BA21	6.45 +/- 000.96(20)
BA23	4.00 +/- 000.81(20)
BA01	4.70 +/- 000.59(20)
BA02	6.15 +/- 000.99(20)
BA03	3.95 +/- 000.58(20)
BA04	7.05 +/- 000.83(20)
BA05	3.35 +/- 000.52(20)
BA06	1.25 +/- 000.41(20)
BA07	0.80 +/- 000.32(20)
BA08	3.15 +/- 000.65(20)
BA09	0.50 +/- 000.21(20)
BA30	2.45 +/- 000.49(20)
BA31	4.25 +/- 000.53(20)
BA32	6.70 +/- 000.76(20)
Pinyon-juniper woodland:	
BA19	1.45 +/- 000.30(20)
BA26	1.25 +/- 000.32(20)
BA27	2.95 +/- 000.70(20)
BA16	1.80 +/- 000.43(20)
BA22	3.05 +/- 000.56(20)
BA24	1.55 +/- 000.49(20)
BA10	1.25 +/- 000.38(20)
BA11	0.95 +/- 000.25(20)
BA12	1.40 +/- 000.39(20)
BA13	4.75 +/- 000.80(20)
BA14	5.85 +/- 000.93(20)
BA15	4.30 +/- 001.02(20)
Brush-beaten sage:	
BA41	0.80 +/- 000.25(20)
BA42	1.45 +/- 000.44(20)
BA43	0.65 +/- 000.15(20)
BA44	7.00 +/- 000.74(20)
BA45	1.25 +/- 000.30(20)
BA46	1.05 +/- 000.25(20)
BA47	3.85 +/- 000.75(20)
BA48	0.90 +/- 000.20(20)
BA49	0.70 +/- 000.21(20)

* n = number of 0.01 acre plots sampled.

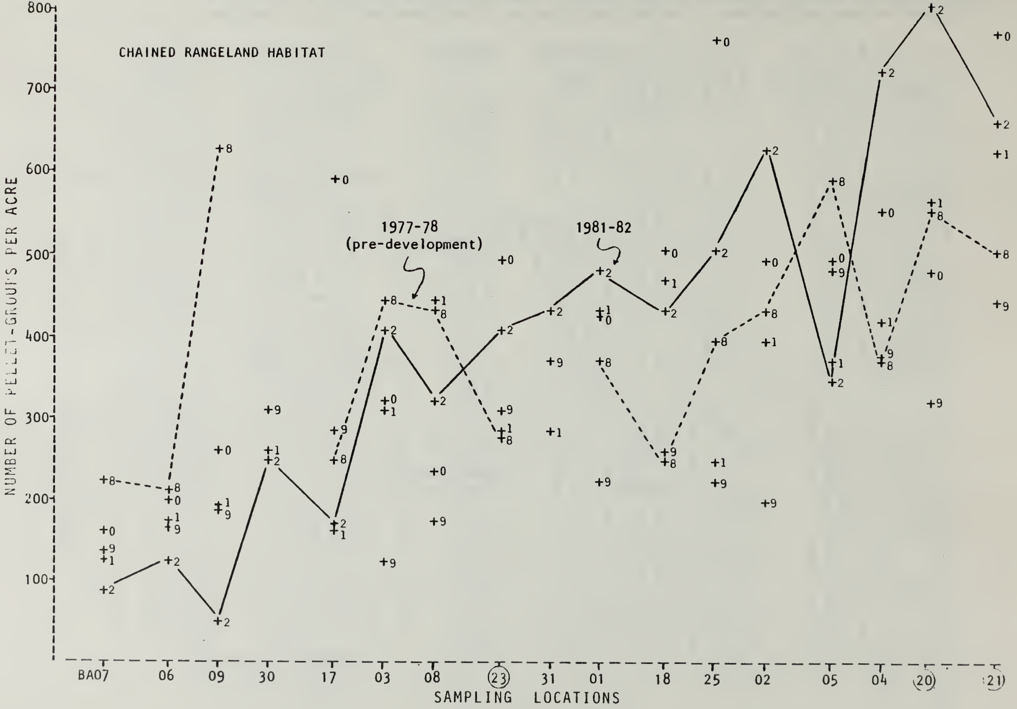


FIG. 2.5.1.1-1 Mule deer pellet-group densities in chained rangeland habitat. Years are indicated by numerals: 8 = 1977-78, 9 = 1978-79, 0 = 1979-80, etc. Circled sampling locations indicate locations close to development activities.

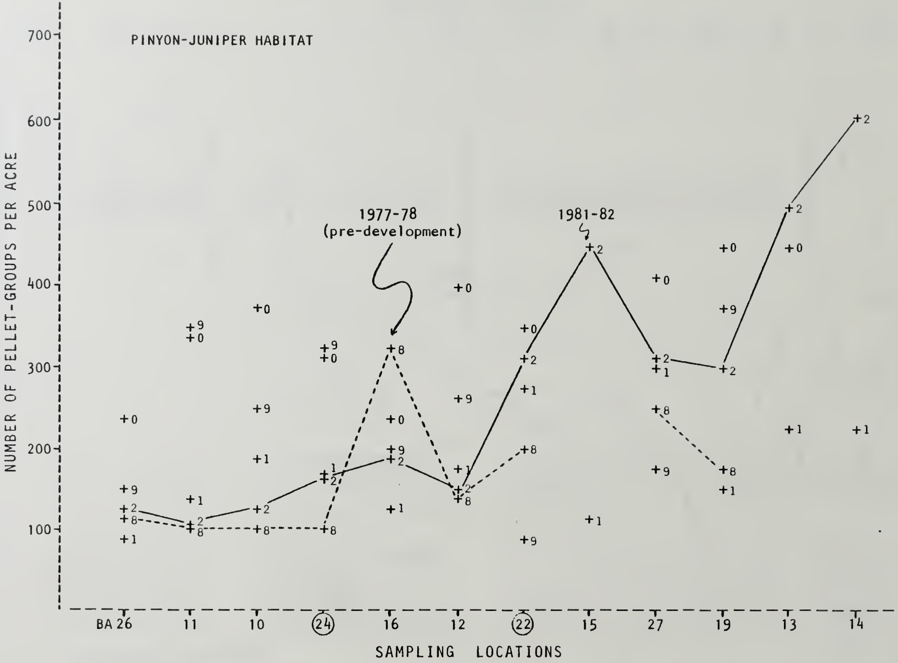


FIG. 2.5.1.1-2 Mule deer pellet group densities in pinyon-juniper habitat. Years are indicated by numerals: 8 = 1977-78, 9 = 1978-79, 0 = 1979-80, etc. Circled sampling locations indicate locations close to development activities.

consequence has occurred. Locations BA06 and BA07 have values for 1981-82 that are lower than any previous year (Figure 2.5.1.1-1), suggesting that deer might well have been displaced by the operation of the drill rig. The null hypothesis of no difference between 1982 pellet-group densities and previous years at transects BA06 and BA07 was tested as follows: differences in density estimates between 1982 values and mean values of all previous years were calculated for each transect location, and expressed as normal deviates (Z = X-X/SD). Values at transects BA06 and BA07 for 1982 were then compared to a table of normal deviates to obtain the probabilities of randomly obtaining values this low.

Probabilities for stations BA06 and BA07 respectively were P=.14 (86% level) and P=.07 (93% level). The conclusion, therefore, is that deer seem likely to have been displaced by the operation of the drill rig, particularly at BA07 where the confidence level exceeds 90 percent. If BA05 and BA09 are omitted from the analysis (which might be justified since they were near the drill rig as well) confidence levels for both BA06 and BA07 exceed the 95% level. It should be mentioned that the validity of this method strongly depends on the precision of the means for pre-impact years (the more pre-impact, i.e., baseline, years the better). Also it is assumed that the difference between 1982 values and mean values for previous years are normally distributed (thus, the more control transects the better). For the present example, sufficient years and sufficient control transects are available to provide a reasonably strong argument that deer were displaced from the immediate vicinity of the drill rig.

An evaluation of the success of sagebrush brush-beating was again evaluated this year using deer-pellet group data. A comparison of differences between treatment and control plots was estimated using a 2-level nested ANOVA (Table 2.5.1-2). Differences were not significant (F=1.09, df=1,7; P=.33).

2.5.1.1.2 Browse Production and Utilization

A summary of the past five years of bitterbrush investigations is presented this year in Figures 2.5.1.1-3 and -4. These figures are similar in format to those used for summarizing deer pellet-group data (Figures 2.5.1.1-1 and -2). Also, they have been prepared with the same objectives in mind; namely, to accommodate the expanding data base and to better portray long-term patterns and trends. As elaborated in the deer pellet-group discussion, the new figures facilitate visual inspection of data points suggestive of disturbance effects.

It will be noted that the biological variable plotted in Figures 2.5.1.1-3 and -4 is percent utilization. This variable is considered a more important browse measurement than degree of hedging--length of shoots remaining after winter browsing (see Section 2.5.1.1.7, Interrelationships). Estimates of hedging, however, as well as browse production are presented in Table 2.5.1.1-3.

TABLE 2.5.1.1-2 Comparison of mule deer pellet-group counts in brush-beaten sagebrush with control areas.

TWO-LEVEL NESTED ANOVA:

Source of Variation	DF	MS	F	Variance Components
Between brush-beaten and control areas	1	97.68	1.09	1.1%
Among subgroup plots	7	89.87	24.95	53.9%
Within plots	171	3.60		45.0%

F (.05; df=1,7) = 5.59   F (.05; df=7,171) =2.07

Transect Means +/- SE (n) =

Brush-beaten		Control	
BA41	80 +/- 25 (20)	BA43	65 +/- 15 (20)
BA42	145 +/- 44 (20)	BA44	700 +/- 74 (20)
BA45	125 +/- 30 (20)	BA47	385 +/- 75 (20)
BA46	105 +/- 25 (20)	BA48	90 +/- 20 (20)
		BA49	70 +/- 21 (20)

Conclusion: No difference in pellet-group densities between brush-beaten and control areas. See text for discussion.

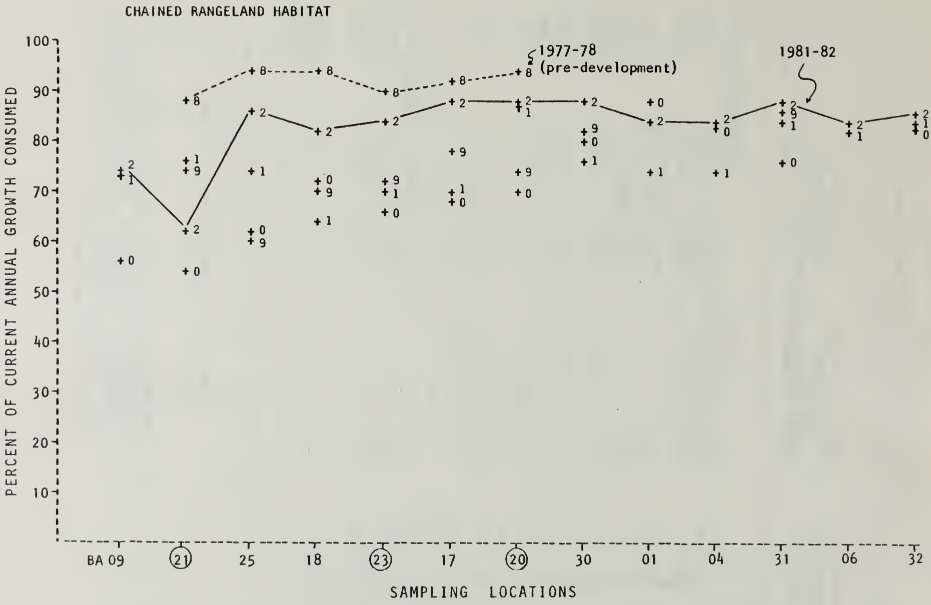


FIG. 2.5.1.1-3 Percent utilization of bitterbrush by mule deer in chained rangeland habitat. Years are indicated by numerals: 8 = 1977-78, 9 = 1978=79, 0 = 1979-80, etc. Circled sampling locations indicate locations close to development activities.

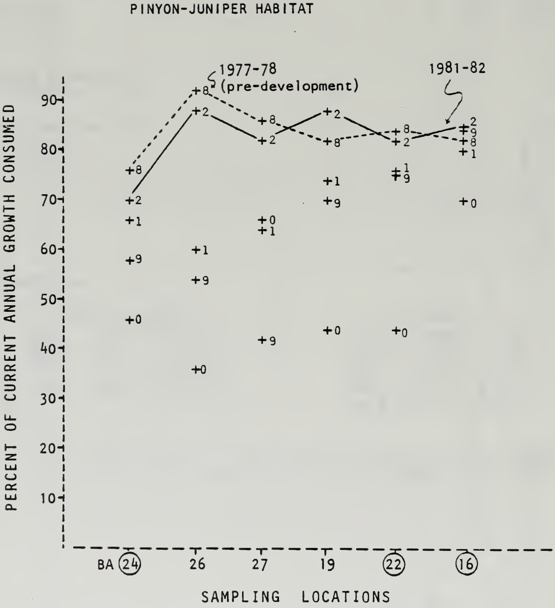


FIG. 2.5.1.1-4 Percent utilization of bitterbrush by mule deer in pinyon-juniper habitat. Years are indicated by numerals: 8 = 1977-78, 9 = 1978-79, 0 = 1979-80, etc. Circled sampling locations indicate locations close to development activities.

TABLE 2.5.1.1-3

Browse production and utilization, 1981-82.

Transect	A PRODUCTION length of new shoots in fall (mm) Mean +/- SE (n)*	B Length of shoots remaining in spring (mm) Mean +/- SE (n)	C UTILIZATION in percent $C = \frac{A-B}{A} x100$
CHAINED RANGELAND:			
BA17	99 +/- 12.6 (10)	13 +/- 2.9 (10)	87
BA18	93 +/- 9.3 (10)	18 +/- 3.7 (10)	81
BA25	71 +/- 10.1 (10)	11 +/- 2.4 (10)	85
BA01	111 +/- 15.3 (10)	18 +/- 3.1 (10)	84
BA04	172 +/- 30.8 (10)	27 +/- 5.3 (10)	84
BA06	75 +/- 9.4 (10)	12 +/- 1.8 (10)	84
BA09	82 +/- 8.5 (10)	22 +/- 2.8 (10)	73
BA30	102 +/- 6.5 (10)	13 +/- 2.1 (15)	87
BA31	100 +/- 7.9 (15)	13 +/- 1.9 (15)	87
BA32	152 +/- 13.3 (15)	22 +/- 2.3 (15)	86
BA20	103 +/- 6.4 (10)	12 +/- 2.2 (10)	88
BA21	82 +/- 11.1 (10)	31 +/-11.0 (10)	62
BA23	144 +/- 24.9 (10)	23 +/- 5.2 (10)	84
PINYON-JUNIPER WOODLAND:			
BA19	86 +/- 10.8 (10)	11 +/- 2.3 (10)	87
BA26	75 +/- 6.7 (10)	9 +/- 3.0 (10)	88
BA27	85 +/- 5.4 (10)	16 +/- 3.7 (10)	81
BA16	87 +/- 6.3 (10)	15 +/- 1.6 (10)	83
BA22	97 +/- 9.7 (10)	18 +/- 4.4 (10)	81
BA24	71 +/- 7.7 (10)	21 +/- 2.9 (10)	70

---

* n = number of shrubs sampled.

Dotted lines and solid lines are again used to facilitate inspection for disturbance effects. It can be readily seen upon examination of Figures 2.5.1.1-3 and -4 that no suspiciously low values indicative of important impacts are present. What is evident, however, is a rather uniform intensity of browsing over both the chained rangeland and pinyon-juniper habitats. This is somewhat in contrast to pellet-group count results (Figures 2.5.1.1-1 and -2), where some locations tend each year to be more heavily used by deer than others.

Sagebrush ocular estimate data are presented in Tables 2.5.1.1-4 and -5. Utilization in the high use category seems to be declining. Table 2.5.1.1-6 presents the results of the Chi-Square Test on sagebrush estimates. The null hypothesis was rejected in the majority of the cases, indicating the high variability between the years of data.

2.5.1.1.3 Migrational Patterns and Phenology

Documentation of mule deer phenology and distributional patterns along Piceance Creek as determined by road counts are presented in Table 2.5.1.1-7 and Figure 2.5.1.1-5. The high count in the fall was 306 deer while the spring count was 809 deer. Comparisons of these results with previous years' findings, particularly of meadows adjacent to Tract C-b, suggest no displacements of deer due to development activities.

2.5.1.1.4 Road Kill

Roadkill data are presented in Table 2.5.1.1-8. Figure 2.5.1.1-6 gives the breakdown of roadkills by mile. The deer roadkill data were analyzed using Chi-Square Test which is presented in Table 2.5.1.1-9. The test results indicate that the roadkill data are highly variable. As in previous years, the breakdown of class is similar. Does were the most killed, followed by fawns and then bucks as shown on Table 2.5.1.1-10.

2.5.1.1.5 Natural Mortality

Deer mortality, as estimated by spring counts of carcasses at permanent study sites, was very low during the winter of 1981-82. Only two carcasses were found (Table 2.5.1.1-11). It is assumed that the low mortality relates to a comparatively mild winter, healthy herd, and good range condition.

2.5.1.1.6 Age-Class Composition

Survival rate of fawns entering into the winter was 81.8 fawns per 100 adults (see Table 2.5.1.1-12). The small sample size may have biased the results. However, the high spring survival rate of 61.1 fawns per 100 adults seems to indicate that a large number of fawns were present at winter's start. This is the highest fawn survival estimate recorded since 1978.

TABLE 2.5.1.1-4

SAGEBRUSH OCULAR ESTIMATED - SUMMER 1982

CHAINED P-J HABITAT

ransect	Sample Size	Paces	Growth Form Young	Mature	Decadent	Utilization Low	Medium	High	Density
01	50	3	14	36	-	49	1	-	4-2-0-2-2 = 14
04	50	3	6	44	-	49	1	-	6-7-7-5-5 = 30
07	50	3	14	35	1	45	5	-	7-11-13-4-3 = 38
09	50	3	9	38	3	40	10	-	11-6-13-7-5 = 42
17	50	3	10	40	-	50	-	-	13-2-2-4-3 = 24
18	50	3	11	38	1	37	12	1	1-10-5-11-3 = 30
20	50	3	16	34	-	32	18	-	3-3-7-5-3 = 21
21	50	3	5	45	-	44	6	-	7-9-8-0-5 = 31
23	50	3	14	36	-	36	14	-	5-4-5-6-2 = 22
25	50	3	5	43	2	40	10	-	7-7-5-4-2 = 25
30	50	3	6	44	-	37	13	-	3-1-3-5-2 = 14
31	50	3	9	41	-	34	15	1	3-4-7-5-9 = 28
32	50	3	13	36	1	40	9	1	1-5-3-7-3 = 19
OTAL	650	-	132	510	8	533	114	3	338
ERCENT			20.3	78.5	1.2	82.0	17.5	0.5	

PINYON JUNIPER HABITAT

ransect	Sample Size	Paces	Growth Form Young	Mature	Decadent	Utilization Low	Medium	High	Density
10	25	3	-	21	4	12	11	2	1-2-0 = 3
11	25	3	1	16	8	9	15	1	4-1-1 = 6
12	25	3	-	19	6	10	10	5	1-2-4 = 7
13	25	3	-	25	-	4	15	6	4-1-5 = 10
14	25	3	-	16	9	8	13	4	5-1-3 = 9
15	25	3	-	19	6	8	13	4	4-4-0 = 8
16	25	3	-	18	7	14	11	-	4-1-2 = 7
19	25	3	-	14	11	20	5	-	1-3-1 = 5
22	25	3	-	18	7	22	3	-	0-1-1 = 2
24	25	3	1	21	3	13	11	1	2-1-2 = 5
26	50	3	-	25	25	28	17	5	2-4-1-1-1 = 9
27	50	3	2	34	14	25	23	2	1-0-3-1-3 = 8
OTAL	350	-	4	246	100	173	147	30	79
ERCENT			1.1	70.3	28.6	49.4	42.0	8.6	

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TABLE 2.5.1.1-5

SAGEBRUSH OCULAR ESTIMATE
1978 - 1982

CHAINED PINYON JUNIPER HABITAT

Year	Growth Form Young	Mature	Decadent	Utilization Low	Medium	High	Shrub Density
1982	20.3	78.5	1.2	82.0	17.5	0.5	338
1981	28.8	68.6	2.6	64.9	32.0	3.1	259
1980	19.5	73.3	6.2	54.0	40.0	6.0	339
1978	7.2	88.0	4.8	41.9	39.3	18.8	309

PINYON JUNIPER HABITAT

Year	Growth Form Young	Mature	Decadent	Utilization Low	Medium	High	Shrub Density[1]
1982	1.1	70.3	28.6	49.4	42.0	8.6	79
1981	1.4	76.2	22.2	45.9	40.0	14.1	97
1980	2.3	52.4	45.3	17.7	38.7	43.6	98
1978	0	48.6	51.4	5.8	40.4	53.8	88

[1] Sagebrush plants/acre = $\frac{\text{Number of shrubs counted}}{\text{Number of sample points}}$ X Basal Area Factor

Basal Area Factor = 40

D:26

TABLE 2.5.1.1-6 Comparisons of Sagebrush Ocular Estimates (1978-1982) Using Chi-Square Test

Ho: There are no differences between year to year sagebrush ocular estimates.

Ha: There are differences between year to year sagebrush ocular estimates.

CHAINED PINYON - JUNIPER HABITAT

Category	X^2	Null Hypothesis $(X^2_{0.05,3}=7.815)$
Young	12.65	Reject
Mature	2.69	Accept
Decadent	4.03	Accept
Low	14.33	Reject
Medium	10.17	Reject
High	27.84	Reject
Density	13.56	Reject

PINYON - JUNIPER HABITAT

Category	X^2	Null Hypothesis $(X^2_{0.05,3}=7.815)$
Young	3.45	Accept
Mature	8.76	Reject
Decadent	15.35	Reject
Low	45.98	Reject
Medium	0.08	Accept
High	48.70	Reject
Density	2.62	Accept

D:26

TABLE 2.5.1.1-7

DEER ROAD COUNT

JUNE 1982 - DECEMBER 1982

	SEP	OCT			DEC	
	29	6	13	20	15	24
MILES						
BM00		61	27	51	26	9
BM01					4	1
BM02		5			9	8
BM03				6		5
BM04					3	1
BM05			1		2	
BM06			3			
BM07						4
BM08						2
BM09				25	9	25
BM10			1	48		
BM11				21	4	
BM12				28		
BM13				3		
BM14				2		
BM15				14		
BM16			10	47		
BM17				63		2
BM18			62	**		
BM19			7	40	3	
BM20			12	34		
BM21			4	14		
BM22				44	1	
BM23				3		
BM24			5		3	7
BM25					1	
BM26		3				
BM27						
BM28						3
BM29						4
BM31				4		
BM32						
BM33						
BM34						
BM35						3
BM36						
BM37					4	
BM38						9
BM39						7
BM40						7
BM41	1					
TOTAL						
	1	69	**	**	69	97

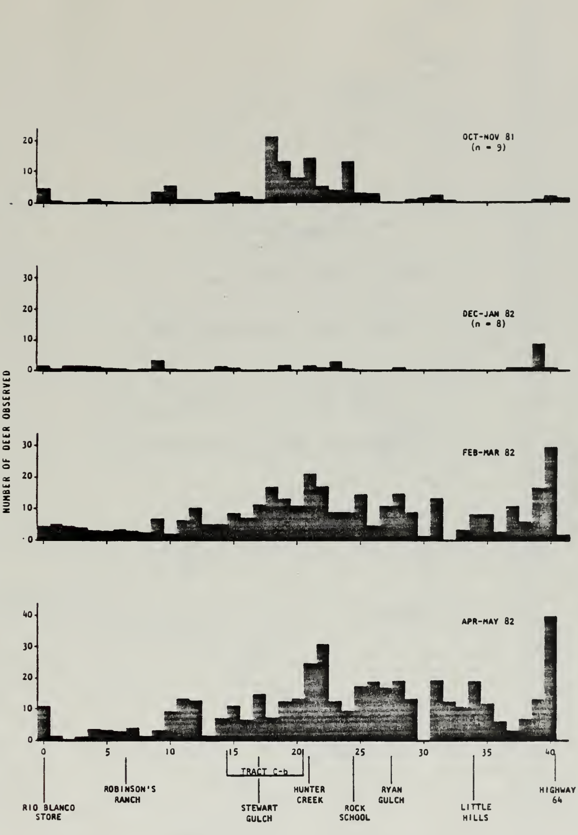

FIG. 2.5.1.1-5

Summary of deer counts for 1981-82. Heights of bars are means; sample sizes (n) are the number of road counts for the period.

TABLE 2.5.1.1-8

DEER ROAD KILL

JUNE 1982 - DECEMBER 1982

	82						
	SEP	OCT			DEC		
MILES	29	6	13	20	15	22	29
00			1				
09						1	
11					1		
19					1		
24							1
34					1		
39					1		
TOTAL			1		4	1	1

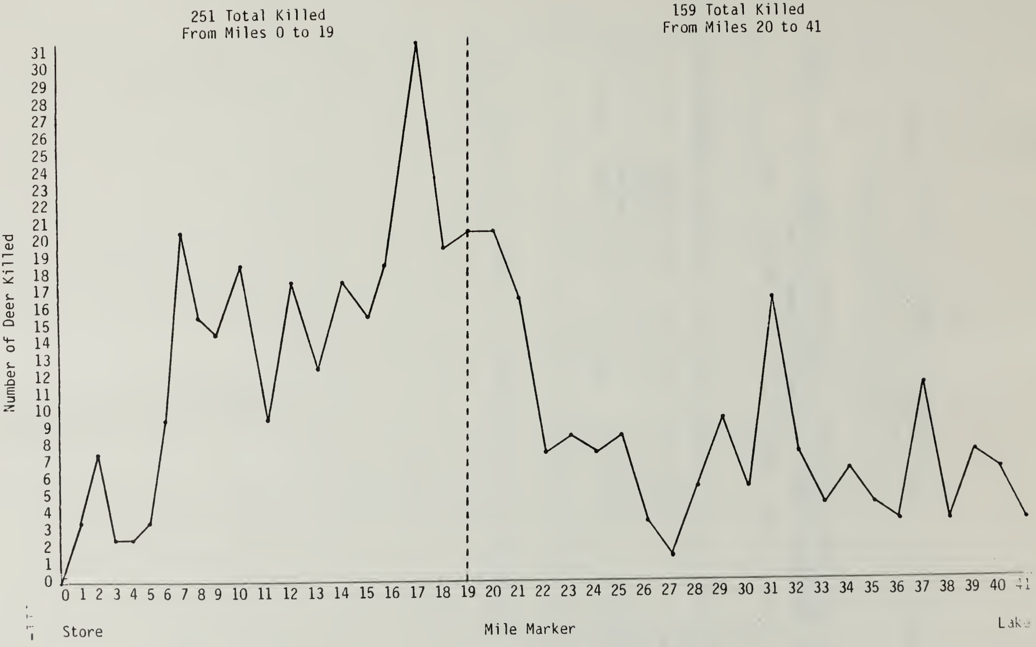

FIGURE 2.5.1.1-6

Accumulative Piceance Creek Road Kill (1977-82)

TABLE 2.5.1.1-9 Deer Roadkill data analyzed using Chi-Square Test

Ho: Deer roadkill data does not vary from year to year.

Ha: Deer roadkill data is variable from year to year.

Class	X^2	Null Hypothesis ($X^2_{0.05,4}=9.488$)
Does	61.46	Reject
Fawns	45.1	Reject
Bucks	9.0	Accept
Unknown	3.0	Accept
Total Kill	80.94	Reject

TABLE 2.5.1.1-10

Piceance Creek Road Kill
(Piceance Creek Road from Mile 0 thru Mile 41)

Date	Does		Fawns				Bucks		Unknown	TOTAL
			Male		Female					
	No.	%	No.	%	No.	%	No.	%		
9-81 to 5-82	30	56	3	6	12	22	6	12	3	54
9-80 to 5-81	12	43	3	11	6	22	2	7	5	28
9-79 to 5-80	40	41	22	22	26	27	3	3	5	96
9-78 to 5-79	80	61	13	10	27	21	11	8	0	131
9-77 to 5-78	40	41	28	29	22	22	8	8	2	100*

* Total road kill was 125 deer. This figure was derived from combining DOW data with C-b data.

TABLE 2.5.1.1-11

Results of deer mortality studies.

Year	Sampling Location	No. of carcasses found	Hectares sampled (acres)	Carcasses per hectare (acre)
1974-75	Lateral draws	11	7.25 (18)	1.5 (0.6)
1975-76	Lateral draws	8	7.25 (18)	1.1 (0.4)
1976-77	Interim monitoring period - No sampling			
1977-78	Sagebrush lateral draw	25	70.5 (174)	0.4 (0.1)
1978-79	Sagebrush-lateral draw	34	70.5 (174)	0.5 (0.2)
1979-80	Sagebrush-lateral draw	60	70.5 (174)	0.9 (0.3)
1980-81	Sagebrush-lateral draw	16	70.5 (174)	0.2 (0.1)
1981-82	Sagebrush-lateral draw	2	70.5 (174)	0.03 (0.01)

TABLE 2.5.1.1-12

Age Class Composition of Mule Deer Wintering Near Tract C-b.

Date	Fawns	Does	Bucks	Adults	Fawns/ 100 Does	Bucks/ 100 Does	Fawns/ 100 Adults
1977 Nov. 15-23	85	107	28	135	79.4	26.2	63.0
1978 Apr. 4-7	68			104			65.0
1978 Nov. 13-27	151	159	35	194	95.0	22.0	77.8
1979 Apr. 20-26	41			343			12.0
1979 Nov. 27- Dec. 7	46	62	8	70	74.1	12.9	65.7
1980 Apr. 21-24	26			375			6.9
1980 November	No Count						
1981 Apr. 25	24			68			35.2
1981 Nov. 30- Dec. 4	27	31	2	33	87.1	6.5	81.8
1982 April 13-14	204			334			61.1

2.5.1.1.7 Interrelationships of Mule Deer Studies

Two topics will be considered in the following discussion: 1) a comparison of the variability found in estimates of deer pellet-group densities and the three browse measurements--percent utilization, hedging, and production; and 2) a preliminary examination of multivariate approaches to interpretation that incorporate both the pellet-group and the browse measurements.

Of central importance to monitoring is the ability to detect important changes, and to do so with some degree of statistical confidence. Consequently, it is desirable to single out indicator variables that have relatively little within-group variability, or error variance. Differences between groups (between areas or between time periods) can be more readily detected if within-group differences are small. A convenient way of comparing the amount of variability amoung different measurements is by comparing coefficients of variation, CV, (where CV = SD/X, expressed as a percent). The CV standardizes different scales of measurement permitting direct comparisons of variability regardless of the measurement units used. The bigger the CV, the greater the variability.

Table 2.5.1.1-13 shows coefficients of variation for four measurements: pellet-group counts, percent utilization of bitterbrush, hedging of bitterbrush, and bitterbrush production. The CV's for the browse measurements were obtained from bitterbrush shrubs within or near the same quadrats that were used for pellet-group counts. All measurements were obtained this past year. It is readily apparent upon examination of the table that percent utilization is least variable of all four measurements. Pellet-group counts are the most variable. It should also be mentioned that pellet-group counts are based on n = 20 (20 quadrats per transect), whereas browse measurements are based on n = 10 (10 shrubs per transect). Thus, pellet-group data would have even higher CVs if sample sizes were halved. These findings suggest that percent utilization is the single best variable to use for detecting differences in deer numbers. However, as discussed below, analyzing all available data is nonetheless considered the best procedure.

Optimizing time and effort devoted to sampling shrubs were evaluated during the early stages of the monitoring program, in 1975-76. It seems worthwhile to reevaluate sampling efficiency occasionally, however, because of the time required to conduct the shrub field studies. This is done below by an examination of the distribution of variance encountered over the heirarchial levels of the cluster sampling design. Measurements are current annual shoot growth of bitterbrush obtained this past year (i.e., production estimates of 1982).

3-LEVEL NESTED ANOVA:

Source of Variation	Components of Variance	DF
Between chained and pinyon-juniper habitat	5.6%	1
Among transects	2.6%	8
Among shrubs	23.0%	90
Among shoots	68.8%	900

TABLE 2.5.1.1-13 A comparison of the relative variability among pellet-group[1] and bitterbrush[2] measurements.

Transects	Pellet-group counts	Percent utilization	Hedging[3]	Production[4]
	COEFFICIENTS OF VARIATION (=SD/$\overline{X}$ x 100)			
CHAINED RANGELAND:				
BA17	91.6	6.9	71.8	40.1
BA18	68.5	11.6	64.8	31.5
BA25	55.8	16.9	70.1	45.3
BA01	56.1	12.6	54.3	43.6
BA06	146.5	10.4	49.7	39.8
BA09	189.2	21.4	41.0	32.5
BA30	90.3	6.4	62.8	12.9
BA31	55.5	6.7	58.3	28.1
BA32	50.6	9.2	41.6	40.1
BA20	61.1	7.1	59.8	19.6
BA21	66.4	10.9	70.4	43.0
BA23	91.0	3.8	71.8	54.8
Mean:	85.2	10.3	64.9	35.9
PINYON-JUNIPER:				
BA19	93.5	11.1	69.0	39.5
BA26	115.7	15.0	103.0	28.4
BA27	105.8	14.5	73.3	20.2
BA16	107.5	10.7	31.9	23.0
BA22	82.7	13.3	77.3	31.5
BA24	141.2	23.8	43.0	34.3
Mean:	107.7	14.7	66.3	29.5

---

[1] n = 20, 20 quadrats per transect

[2] n = 10, 10 shrubs per transect

[3] length of current annual growth after winter browsing

[4] length of current annual growth

It is evident that shoot measurements are most variable (accounting for 68.8 percent of the total variance). Shrub-to-shrub variability accounts for 23 percent. Relatively little variability occurs among transects. The difference between habitats, although rather small, is statistically significant (F=6.01, P=.04), the chained habitat being the most productive. Since the greatest variation is among shoots there is some argument for increasing the number of shoots measured on each shrub, but this is not recommended because of the additional labor required for these measurements.

Although browse measurements are not as variable as pellet-group counts (on Tract C-b at least), pellet-group counts require comparatively little effort and thereby permit more area to be sampled given the same amount of time. Furthermore, both data sets provide information on mule deer abundance and distribution, and consequently, both should be considered valuable in themselves as separate indicator variables. The lack of strong within-year correlations between pellet-group counts and percent utilization was pointed out in last year's report. The correlation this past year was again low (r=0.01). These results are interpreted as meaning only that at the spatial scale of this study (specifically, the transect size to habitat patch size relationship) the two data sets are not in agreement (browsing and defacation do not necessarily occur at the same spot). This weak correlation might be an advantage, however, in a multivariate statistical approach, at least for certain combinations of variables. One exploratory examination of the predictive power of combining variables was undertaken this past year. Using percent utilization as the dependent variable, pellet-group data and bitterbrush production data were used together as independent variables in a multiple regression model to see if both, in linear combination, would better explain the variance associated with percent utilization than either variable considered alone. But the multiple correlation coefficient was very low (r=0.02). Thus, there was almost no increase in predictive power with this combination of variables. Another possibility, however, would be to combine pellet-group and percent utilization data in a multivariate analysis of variance (MANOVA) model. This will be pursued in the future particularly in situations where mitigation or impact areas are to be compared with control areas.

MEDIUM-SIZED
MAMMALS

2.5.1.2 Medium-sized Mammals

2.5.1.2.1 Coyote Scent Post Surveys

These surveys were discontinued during Interim Monitoring.

2.5.1.2.2 Lagomorph Abundance

Lagomorph pellet census is used to estimate lagomorph abundance. The 39 transects established for deer pellet studies are also used to collect lagomorph pellet data. Each transect consists of 20 - 0.001 acre plots (see Figure 2.5-1 for locations of transects). Transects are located in chained-rangeland, pinyon-juniper woodland and brush-beaten sage areas. Results of the summer 1982 pellet group census for both cottontails and jackrabbits are shown in Table 2.5.1.2-1.

A preliminary examination of cottontail population trends was performed this year by reviewing the data available since 1978-79. Prior to this date, methods were somewhat different and results are not valid for comparisons. A summary of cottontail results since 1978-79 is shown in Table 2.5.1.2-2. As can be seen upon examination of the table no definite trends are evident for the 4-year period. The low values for the brush-beaten sagebrush plots, however, suggest real differences between these treatment-control sites. Control plots in unmodified sagebrush have considerably higher values for the past two years. Differences for both 1980-81 and 1981-82 are significant (t=2.46, df=7, P=0.04; and t=2.65, df=7, P=0.03, respectively). The effects of brush-beating on cottontail populations will continue to be evaluated in future years. Presently it seems premature to attempt definitive conclusions regarding the seemingly negative effects of brush-beating on cottontail populations.

TABLE 2.5.1.2-1

Relative abundance of cottontails and jackrabbits, 1981-82. Each transect consists of twenty 0.001 acre plots.

	NUMBER OF PLOTS WITH LAGOMORPH DROPPINGS	
Transects	Cottontails	Jackrabbits
CHAINED RANGELAND:		
BA01	4	0
BA02	5	0
BA03	9	0
BA04	5	0
BA05	6	0
BA06	15	0
BA07	7	0
BA08	10	0
BA09	10	0
BA17	11	0
BA18	0	0
BA20	0	0
BA21	8	0
BA23	3	0
BA25	13	0
BA30	10	0
BA31	6	0
BA32	8	0
PINYON-JUNIPER:		
BA10	10	0
BA11	9	0
BA12	13	0
BA13	19	0
BA14	6	0
BA15	4	0
BA16	8	0
BA19	12	3
BA22	8	0
BA24	7	0
BA26	18	0
BA27	15	0
BRUSH-BEATEN SAGE:		
BA41	1	0
BA42	2	0
BA43	10	0
BA44	7	0
BA45	0	0
BA46	1	0
BA47	0	0
BA48	14	0
BA49	15	0

TABLE 2.5.1.2-2 Summary of results of cottontail trends. Data shown are means (number of quadrats with cottontail droppings present/total number of quadrats) +/- SE (n); n = number of transects (which consist of 20, 0.001 acre, quadrats).

	HABITAT			
Year	Chained rangeland	Pinyon-juniper	Brush-beaten sagebrush	Sagebrush control
1978-79	8+/-1.2 (18)	11+/-1.6 (12)	-	-
1979-80	12+/-0.9 (15)	11+/-1.3 (12)	-	-
1980-81	9+/-0.7 (18)	13+/-0.8 (12)	3+/-0.9 (4)	12+/-3.1 (5)
1981-82	7+/-1.0 (18)	11+/-1.4 (12)	1+/-0.4 (4)	9+/-2.7 (5)

SMALL
MAMMALS

2.5.1.3 Small Mammals

Objectives of small mammal studies during 1982 were: 1) to evaluate the spatial variability of small mammal populations, and from these findings predict the magnitude of a population decline needed for detection; and 2) to evaluate certain habitat features within the chained rangeland habitat as predictors of small mammal abundance.

2.5.1.3.1 Experimental Design

Methods for evaluating spatial variability were as follows: Ten locations were randomly chosen, each in a different but contiguous square-mile section. All sampling occurred in chained rangeland habitat and was restricted to ridge tops and adjacent convex slopes; valleys were avoided because of the different vegetation type. Four transects of livetraps were positioned at each location the first day using a systematic random design (the first location of regularly spaced transects was a random choice.) Transects were parallel, 10m apart, and consisted of ten traps spaced at 10m intervals.

Each set of four transects was moved ahead 10m each day for six days. Each location, therefore, received a 240 trap-night effort (or n=24, since each transect of ten traps represents one sample).

Methods for evaluating habitat features and their importance to small mammals were as follows: At all 240 transects (24 per location x 10 locations) measurements were obtained on eight characteristics that were considered likely to be important small mammal habitat components. These are listed below along with the measurement scale used.

Habitat Features	Measurement Scale
Amount of deadfall (large limbs and stumps)	1 - 5
Amount of loose rock (rocks > 6 inches)	1 - 5
Amount of grass-forb cover	1 - 5
Cover by sagebrush	1 - 5
Cover by bitterbrush	1 - 5
Cover by conifer	1 - 5
Aspect: east facing	East
Aspect: west facing	West

Measurements were made by one individual. All measurements pertain to a 1000m^2 area (the transect length times 5m to either side of transect).

2.5.1.3.2 Method of Analysis

A 2-level nested analysis of variance (ANOVA) and a least significant difference (LSD) test were used for evaluating spatial variability and predicting the magnitude of a population decline needed for detection. A multiple regression model was used to evaluate habitat features as predictions of small mammal abundance.

2.5.1.3.3 Discussion and Results

Two species were captured frequently enough to permit analysis of spatial variability, the deer mouse and least chipmunk. ANOVA results and calculations of LSD for the deer mouse data are shown in Table 2.5.1.3-1. A very low percent of the total variance occurred among locations and among days for both species (0.1% and 4.6% for deer mice, and 1.2% and 8.5% for least chipmunks, respectively), indicating that both deer mice and least chipmunks were about equally abundant throughout the habitat and that day-to-day differences in activity patterns were minimal. For both species over 90% of the variance occurred among transects.

To predict the change in abundance needed for detection, a hypothetical sampling device was considered in which an identical trapping effort took place in a nearby impact area of the same habitat type. An LSD was calculated (Table 2.5.1.3-1) to find the least significant difference necessary for recognizing the two areas (impact area and control area) as being different in abundance levels. Based on this approach it was found that an impact suppressing deer mice and least chipmunk populations by 2.3% and 7.4% respectively would be detected at the 95% level. Capture data obtained during this study are shown in Table 2.5.1.3-2.

To evaluate the eight selected habitat features as predictors of small mammal abundance, deer mice and least chipmunk capture results were used as dependent variables in separate multiple regression analyses. Results demonstrated that none of the habitat features measured were correlated with capture frequencies (Table 2.5.1.3-3 and -4). Furthermore, standardized coefficients (beta weights) and the overall measure of association, the coefficient of determination (R^2), suggest that there is no predictive power using the combination of habitat variables chosen. These results are probably a reflection of the homogeneity of the habitat stratum within which sampling occurred. There simply is not much range of variation for any of the eight variables.

It is likely, for example, that deadfall and loose rock would have been singled out as important if a number of the sampling locations had been in areas totally devoid of these habitat features.

TABLE 2.5.1.3-1 Evaluation of spatial and temporal variation in a deer mouse population. Calculations below the ANOVA table illustrate a means of approximating the magnitude of a hypothetical impact required for detection based on these results.

TWO-LEVEL NESTED ANALYSIS OF VARIANCE:

Source of Variation	DF	MS	F	Variance Components
Among Locations	9	1.465	1.05	0.003 (0.1%)
Among Days	50	1.400	0.80	0.089 (4.6%)
Error	180	1.756		(95.3%)

F (.05), df=9,50 = 2.07 F (.05), df=50,180 = 1.42

Grand Mean of control area = 2.11 (the mean number of captures per location, pooled for 10 locations; capture success, therefore = 21.1%).

$$\text{LSD} = t_{\alpha(df)}\sqrt{2\ (\text{location variance}/n)}$$

where

LSD = Least Significant Difference (Sokal & Rohlf 1981),

α = .05, the selected probability level,

df = degrees of freedom (based on 480 transects, 240 in both control and hypothetical impact areas),

n = 10 locations, the sample size in control and impact areas.

thus

$$\text{LSD} = 1.965\ \sqrt{2\ (.003)/10} = .048$$

Therefore, if a Grand Mean from a hypothetical impact area (with the same variance) lies outside the range of 2.11 +/- 0.048 (e.g., a population decline of 2.3%) it would be judged significantly different from the control area Grand Mean at the 95% level.

TABLE 2.5.1.3-2

Relative abundance of small mammals, 1982.[1] Actual number of animals captured is shown in brackets. Trapping locations were randomly chosen in chained rangeland habitat; 240 trap-nights[2] occurred at each of the ten locations.

Species	LOCATION NUMBERS 1	6	7	8	11	12	13	14	17	18
Deer Mouse *Peromyscus maniculatus*	19.2 *{46}*	20.0 *{48}*	17.5 *{42}*	18.3 *{44}*	22.5 *{54}*	20.4 *{49}*	22.1 *{53}*	25.4 *{61}*	23.8 *{57}*	21.7 *{52}*
Least Chipmunk *Eutamias minimus*	13.3 *{32}*	16.3 *{39}*	18.8 *{45}*	18.8 *{45}*	14.6 *{35}*	14.6 *{35}*	16.7 *{40}*	9.6 *{23}*	19.2 *{46}*	14.6 *{35}*
Golden-mantled Ground Squirrel *Spermophilus lateralis*	2.5 *{6}*	1.3 *{3}*	0.8 *{2}*	0.8 *{2}*		0.8 *{2}*	0.8 *{2}*			0.8 *{2}*
Bushy-tailed Woodrat *Neotoma cinerea*			0.4 *{1}*							
Apache Pocket Mouse *Perognathus apache*						0.4 *{1}*				

---

[1] Relative abundance = number of captures ÷ number of trap-nights x 100.

[2] A trap-night is one trap set one night.

TABLE 2.5.1.3-3 Relationships of eight habitat features and abundance of deer mice in chained rangeland habitat. Data are from a multiple regression analysis. Abundance of deer mice is the dependent variable.

Variables		Correlation matrix[1]									Beta weights[2]
		Pm	DF	LR	GF	S	B	C	E	W	
Abundance of deer mice	(Pm)	1									
Amount of deadfall	(DF)	-.01	1								-.01
Amount of loose rock	(LR)	.01	-.03	1							-.03
Cover by grass-forb	(GF)	-.04	.03	-.11	1						-.05
Cover by sagebrush	(S)	-.04	.07	-.05	-.07	1					-.03
Cover by bitterbrush	(B)	.06	.17	.15	-.06	-.40	1				.05
Cover by conifer	(C)	.11	-.16	.07	-.05	-.07	.08	1			.12
East-facing slope	(E)	-.05	-.14	-.14	-.14	-.17	.06	.23	1		-.11
West-facing slope	(W)	.02	.13	.25	.01	.24	-.10	-.04	-.50	1	-.01

The coefficient of determination[3] $R^2 = .02$ (F = .74, df = 8,231, P = .66)

[1] The correlation matrix shows the separate bivariate correlations (absolute values >.14 are significant at $\alpha = .05$).

[2] Beta weights are standard partial regression coefficients. They express the relative importance of the variable after partialing out the effects of the other variables.

[3] The coefficient of determination, R^2, is an expression of the proportion of the total variability in the capture data attributable to the eight habitat variables. In this case only 2% ($R^2 = .02$) of the variability is explained by the multiple regression.

TABLE 2.5.1.3-4 Relationship of eight habitat features and abundance of least chipmunks in chained rangeland habitat. Data are from a multiple regression analysis. Abundance of least chipmunks is the dependent variable.

Variables		Correlation matrix[1]									Beta weights[2]
		Em	DF	LR	GF	S	B	C	E	W	
Abundance of chipmunks	(Em)	1									
Amount of deadfall	(DF)	-.03	1								-.01
Amount of loose rock	(LR)	.10	-.03	1							.12
Cover by grass-forb	(GF)	.01	.03	-.11	1						.02
Cover by sagebrush	(S)	-.01	.07	-.05	-.07	1					.01
Cover by bitterbrush	(B)	-.03	.17	.15	-.06	-.40	1				-.05
Cover by conifer	(C)	.04	-.16	.07	-.05	-.07	.08	1			.03
East-facing slope	(E)	.04	-.14	-.14	-.14	-.17	.06	.23	1		.04
West-facing slope	(W)	-.02	.13	.25	.01	.24	-.10	-.04	-.50	1	-.04

The coefficient of determination[3] $R^2 = .02$ ($F = .51$, $df = 8,231$, $P = .85$)

---

[1] The correlation matrix shows the separate bivariate correlations (absolute values >.14 are significant at $\alpha = .05$).

[2] Beta weights are standard partial regression coefficients. They express the relative importance of the variable after partialing out the effects of the other variables.

[3] The coefficient of determination, R^2, is an expression of the proportion of the total variability in the capture data attributable to the eight habitat variables. In this case only 2% ($R^2 = .02$) of the variability is explained by the multiple regression.

2.5.1.4 Avifauna

2.5.1.4.1 Avifauna

No avifauna studies were conducted during the Interim Monitoring Period.

2.5.1.4.2 Raptor Activity

Raptor nesting data for 1976 through 1982 are listed in Table 2.5.1.4-1. The April census showed nine active nests. The June census showed six active nests having young birds present. Two nests were occupied by golden eagles, two by red-tailed hawks and two-by great-horned owls.

Our raptor population seems to be fairly stable in the study area. The population consisted mostly of red-tailed hawks, kestrels and great-horned owls during the summer while marsh, red-tailed, and rough legged hawks made up the majority of the winter population.

In addition to the nesting raptors, other raptors observed in the study area included: American kestrels, turkey vultures, sharp-shinned hawks, marsh hawks, night hawks, and bald eagles.

TABLE 2.5.1.4-1

RAPTOR NESTING RECORD

st No.	Species	Status 1976 April	Status 1976 June	Status 1977 April	Status 1977 June	Status 1978 April	Status 1978 June	Status 1979 April	Status 1979 June	Status 1980 April	Status 1980 June	Status 1981 April	Status 1981 June	Status 1982 April	Status 1982 June
1	Unknown	I		I	I	I	I	I	I	I	I	I	I	1	1
2	Unknown	I		I	I	I	I	I	I	I	I	I	I	1	1
3	Unknown	I		I	I	I	I	I	I	I	I	Nest Gone			
4	Red-tailed Hawk	E or Y		I	I	I	I	I	I	I	I	I	I	I	I
5	Unknown	I		I	I	I	I	I	I	I	I	I	I	I	I
5a	Common Raven	-		-	E or Y	I	I	I	I	I	I	A	I	I	I
6	Golden Eagle	E		I	2Y	I	I	E or Y	I	1Y	1Y	E	I	I	I
7	Red-tailed Hawk	I		I	-	E	I	E or Y	I	E or Y	1Y	E	2Y	I	I
8	Red-tailed Hawk	4Y		I	I	E	I	E or Y	I	I	I	I	I	I	I
9	Common Raven	I		I	I	I	I	I	I	E	2Y	I	I	I	I
10	Red-tailed Hawk	I		I	I	I	I	I	I	I	I	I	I	I	I
11	Nest Gone														
12	Red-tailed Hawk	I		I	I	E	1Y	I	I	I	I	I	I	I	I
13	Red-tailed Hawk	I		I	I	I	I	E or Y	I	I	I	I	I	I	I
14	Unknown	I		I	I	I	I	I	I	I	I	I	I	A	I
15	Unknown	I		I	I	I	I	I	I	I	I	I	I	I	I
16	Great Horned Owl	I		I	I	E	2Y	I	I	I	I	I	I	I	I
17	Great Horned Owl	I		I	I	I	I	I	I	I	I	I	I	I	I
18	Red-tailed Hawk	I		I	I	I	I	1Y	I(GHO)	I	I	I	I	I	I
19	Great Horned Owl	1Y		I	I	I	I	I	I	I	I	I	I	I	I
20	Unknown							I	I	Packrats					
21	Not on map														
22	Red-tailed Hawk	I		I	I	I	I	E or Y	I	I	2Y	A	I	E	1Y?
23	Not on map														
24	Red-tailed Hawk	I		I	I	I	I	I	I	Packrats		E	(?)Y	I	I
25	Great Horned Owl	I		I	I	I	I	I	I	Packrats					
26	Unknown	I		I	I	I	I			Nest Gone					
27	Red-tailed Hawk	I		I	I	I	I	E or Y	I	I	I	E	1Y	E	1Y
28	Golden Eagle	1Y		I	I	I	I	I	I	I	I	I	I	I	I
29	Unknown	I		I	I	I	I	I	I	I	I	I	I	I	I
0	Red-tailed Hawk	2Y		I	I	I	I	I	I	I	I	I	I	I	I
1	Unknown	I		I	I	I	I	I	I	I	2Y(RTH)	I	I	I	I
2	Great Horned Owl	2Y		2Y	-	I	I	I	I	I	I	I	2Y(RTH)	I	I
33	Unknown	I		I	I	I	I	I	I	I	I	I	2Y(RTH)	A	I
34	Unknown	I		I	I	I	I	I	I	I	I	I	I	A	I
35	Unknown	I		I	I	I	I	I	I	I	I	I	I	E(GHO)Y?	
36	Red-tailed Hawk	2Y		I	I	I	I	E	2Y	I	I	I	I	I	I
37	Unknown	I		I	I	I	I	I	I	I	I	I	I	I	I
38	Raven	I		I	I	I	I	E or Y	Y	I	E or Y	A	A	I	I
39	Golden Eagle	1Y		I	I	I	I	I	I	I	I	I	I	E	1Y
40	Great Horned Owl	I		I	I	E	2Y	2Y	I	I	I	I	I	I	I
41	Unknown	I		I	I	I	I			Nest Gone				I	I
42	Unknown	I		I	I	I	I	I	I	I	I	I	I	I	I
42a	Red-tailed Hawk	-		-	2Y	I	I	E or Y	I(GHO)	I	I	I	I	I	I
43	Great Horned Owl	2Y		I	I	I	I	I	I	I	I	I	I	I	I
44	Unknown	I		I	I	I	I	I	I	I	I	I	I	I	I
45	Red-tailed Hawk	2Y		I	I	I	I	E	2Y	I	2Y	I	I	I	I
46	Red-tailed Hawk					E	I	E or Y	I	I	I	I	I	I	I
47	Unknown					I	I	I	I	I	I	I	I	I	I
48	Great Horned Owl							E	I	I	I	E(RTH)	1Y	E	Y?
49	Magpie							E	I	I	I	I	I	I	I
50	Red-tailed Hawk									I	I	I	I	I	I
51	Golden Eagle									I	1Y	I	I	E	1Y
52	Red-tailed Hawk									I	I	I	1Y	I	I
	TOTAL ACTIVE NESTS	11		4		6		15		8		8		6	

Code:

I = inactive nest
A = signs of activity (ex. fresh boughs, bird near nest)
E = adult bird observed in an incubating posture; presumed to be incubating eggs.
(2) Y = number of young observed in the nest.
E or Y = adult bird observed in an incubating posture; due to time of year, assumed to be either incubating eggs or brooding very young chicks.

AQUATIC STUDIES

2.5.2 Aquatic Studies

2.5.2.1 Introduction

Aquatic sampling was conducted from May 1982 through November 1982.

2.5.2.2 Scope of Work

Aquatic studies consisted of periphyton and benthos sampling.

2.5.2.3 Benthos

2.5.2.3.1 Methods of Benthos Sampling and Analyses

Benthic macroinvertebrate sampling stations located in Piceance Creek (Figure 2.5.2-1) are the same as the current periphyton collection stations. Six collections were obtained at approximately one month intervals between May and October, 1982. CB staff biologists used a standard Surber sampler to provide three replicates from each station per sampling date. Each replicate was placed in a labeled container, preserved with 10% formalin on site, and mailed to Mariah Associates' Aquatics Laboratory in Laramie, Wyoming for further processing and analysis.

Upon arrival, the samples are washed over a fine mesh sieve (U.S. No. 60). Organisms are separated from debris and placed in vials of 80% ethyl alcohol. Identification and enumeration are accomplished with the aid of a Bausch and Lomb Stereo Zoom 7 (5x-210x) dissecting microscope. Whole oligochaete and chironomid head capsules are mounted in Hoyers cleaning and mounting medium and identified with the use of a Wild Heerbrugg microscope at a magnification of 200x or 400x.

2.5.2.3.2 Results

Benthos data are presented in Tables 2.5.2-1 - 2.5.2.3 as species lists, density and diversity.

The macroinvertebrate community of Piceance Creek is generally low in number of species and reflects the harsh physical environment common to streams in the Piceance Basin of Colorado (Gray and Ward 1978). Thirty macroinvertebrate taxa were collected from Piceance Creek in 1982. Stewart Station exhibited the highest number of total taxa (25) throughout the year, although Middle Station recorded 24 taxa in 1982. Only 11 taxa were identified from Hunter Station. Diversity values were generally low and ranged from 0.03 at Middle Station on June 30 to 1.38 at Middle Station on October 4 (Table 2.5.2-4). Diversity and evenness indices were slightly higher in October and November at Stewart Station and Middle Station and in November at Hunter Station. Generally, diversity, evenness and number of taxa were higher at Stewart and Middle Stations than at Hunter Station throughout 1982.

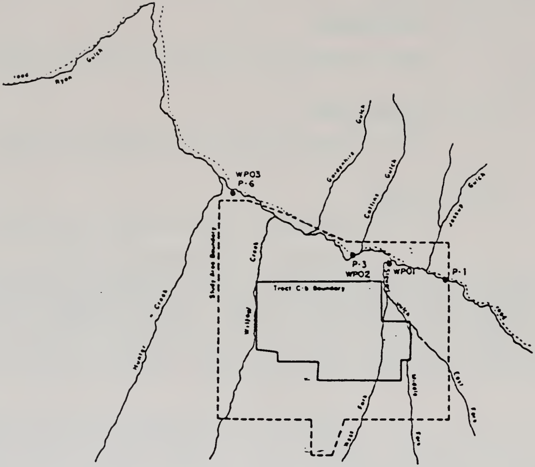
Road
Ryan
Gulch
WPO3
P-6
Gardenhire
Gulch
Collins
Gulch
Gulch
Study Area Boundary
Creek
Willow
Hunter
Creek
Tract C-b Boundary
P-3
WPO2
WPO1
P-1
Road
Middle
Fork
Fork
Coal
Fork

Figure 2.5.2-1

BENTHIC MACROINVERTEBRATE AND PERIPHYTON SAMPLING STATIONS

BENTHOS DATA

Page No.

Table 2.5.2-1 Benthos Species List III-51

Table 2.5.2-2 Benthos Data Sheets III-58

June 1, 1982 III-58
  Station 1 WP01
  Station 2 WP02
  STation 3 WP03

June 30, 1982 III-60
  Station 1
  Station 2
  Station 3

July 29, 1982 III-62
  Station 1
  Station 2

September 2, 1982 III-63
  Station 1
  Station 2
  Station 3

October 4, 1982 III-64
  Station 1
  Station 2
  Station 3

November 3, 1982 III-66
  Station 1
  Station 2
  Station 3

Table 2.5.2-3 BENTHOS DENSITY AND SPECIES DIVERSITY CALCULATIONS III-68

June 1, 1982 III-68
  Station 1
  Station 2
  Station 3

June 30, 1982 III-71
  Station 1
  Station 2
  Station 3

July 29, 1982 II-74
  Station 1
  Station 2

BENTHOS DATA

BENTHOS DENSITY AND SPECIES CALCULATIONS (Continued) Page No.

September 2, 1982 III-76
  Station 1
  Station 2
  Station 3

October 4, 1982 III-78
  Station 1
  Station 2
  Station 3

November 3, 1982 III-81
  Station 1
  Station 2
  Station 3

TABLE 2.5.2-1

BENTHOS SPECIES LIST

CATHEDRAL BLUFFS SHALE OIL COMPANY
PICEANCE CREEK
1982

TAXON	STATION NUMBER WP01	WP02	WP03
PHYLUM NEMATODA	X	X	X
PHYLUM ANNELIDA			
CLASS OLIGOCHAETA			
ORDER HAPLOTAXIDA			
FAMILY TUBIFICIDAE	X	X	X
FAMILY LUMBRICIDAE	X	X	
FAMILY NAIDIDAE	X	X	
CLASS HIRUDINEA			
ORDER RHYNCHOBDELLIDA			
FAMILY GLOSSIPHONIIDAE			
HELOBDELLA STAGNALIS	X	X	X
PHYLUM MOLLUSCA			
CLASS GASTROPODA			
ORDER BASSOMATOPHORA			
FAMILY PHYSIDAE			
PHYSA	X	X	X
CLASS BIVALVIA			
ORDER HETERODONTA			
FAMILY SPHAERIIDAE			
PISIDIUM	X		X
PHYLUM ARTHROPODA			
CLASS ARACHNIDA			
ORDER ACARINA	X	X	
CLASS INSECTA			
ORDER EPHEMEROPTERA			
FAMILY BAETIDAE	X		
BAETIS	X	X	
FAMILY EPHEMERELLIDAE			
EPHEMERELLA (EPHEMERELLA)	X	X	
FAMILY TRICORYTHIDAE			
TRICORYTHODES	X	X	X
ORDER TRICHOPTERA			
FAMILY HYDROPSYCHIDAE			
HYDROPSYCHE	X		
ORDER COLEOPTERA			
FAMILY ELMIDAE			
OPTIOSERVUS	X	X	
ZAITZEVIA PARVULA	X	X	
FAMILY HALIPLIDAE			
BRYCHIUS		X	X
FAMILY DYTISCIDAE			
AGABINUS		X	
ORDER DIPTERA			
FAMILY CERATOPOGONIDAE			
SUBFAMILY CERATOPOGONINAE	X	X	
FAMILY CHIRONOMIDAE		X	
SUBFAMILY TANYPODINAE	X	X	X
TRIBE PENTANEURINI		X	
TRIBE MACROPLEOPIINI		X	
SUBFAMILY ORTHOCLADIINAE			
TRIBES ORTHOCLADIINI AND METRIOCNE	X	X	X
SUBFAMILY CHIRONOMINAE			
TRIBE CHIRONOMINI	X	X	X

TRIBE TANYTARSINI	X	X	X
FAMILY EMPIDIDAE	X		
FAMILY TIPULIDAE	X	X	
HEXATOMA	X		
ORMOSIA	X		
TIPULA	X	X	

X = ORGANISM IDENTIFIED TO THIS TAXONOMIC LEVEL OBSERVED AT SAMPLING STATION

BENTHOS SPECIES LIST

CATHEDRAL BLUFFS SHALE OIL COMPANY
PICEANCE CREEK

SPECIES OCCURRENCE BY SAMPLING DATE AT STATION WP01
1982

TAXON	SAMPLING DATE MAY	JUNE	JULY	AUG	SEPT	OCT
PHYLUM NEMATODA	X	X	X		X	X
PHYLUM ANNELIDA						
CLASS OLIGOCHAETA						
ORDER HAPLOTAXIDA						
FAMILY TUBIFICIDAE	X	X	X	X	X	X
FAMILY LUMBRICIDAE					X	
FAMILY NAIDIDAE		X	X	X	X	X
CLASS HIRUDINEA						
ORDER RHYNCHOBDELLIDA						
FAMILY GLOSSIPHONIIDAE						
HELOBDELLA STAGNALIS		X			X	
PHYLUM MOLLUSCA						
CLASS GASTROPODA						
ORDER BASSOMATOPHORA						
FAMILY PHYSIDAE						
PHYSA			X	X		
CLASS BIVALVIA						
ORDER HETERODONTA						
FAMILY SPHAERIIDAE						
PISIDIUM			X			
PHYLUM ARTHROPODA						
CLASS ARACHNIDA						
ORDER ACARINA			X			
CLASS INSECTA						
ORDER EPHEMEROPTERA						
FAMILY BAETIDAE					X	
BAETIS	X				X	X
FAMILY EPHEMERELLIDAE						
EPHEMERELLA (EPHEMERELLA)	X					
FAMILY TRICORYTHIDAE						
TRICORYTHODES	X	X				
ORDER TRICHOPTERA						
FAMILY HYDROPSYCHIDAE						
HYDROPSYCHE	X					
ORDER COLEOPTERA						
FAMILY ELMIDAE						
OPTIOSERVUS		X	X			
ZAITZEVIA PARVULA						X
ORDER DIPTERA						
FAMILY CERATOPOGONIDAE						
SUBFAMILY CERATOPOGONINAE	X					
FAMILY CHIRONOMIDAE						
SUBFAMILY TANYPODINAE						X
SUBFAMILY ORTHOCLADIINAE						
TRIBES ORTHOCLADIINI AND METRIOCNE	X	X			X	X
SUBFAMILY CHIRONOMINAE						
TRIBE CHIRONOMINI	X					
TRIBE TANYTARSINI						X
FAMILY EMPIDIDAE						X
FAMILY TIPULIDAE					X	
HEXATOMA	X					

[illegible]			X	
TIPULA	X	X	X	X

X = ORGANISM IDENTIFIED TO THIS TAXONOMIC LEVEL OBSERVED AT SAMPLING STATION

BENTHOS SPECIES LIST

CATHEDRAL BLUFFS SHALE OIL COMPANY
PICEANCE CREEK

SPECIES OCCURRENCE BY SAMPLING DATE AT STATION WPO2
1982

TAXON	SAMPLING DATE MAY	 JUNE	 JULY	 AUG	 SEPT	 OCT
PHYLUM NEMATODA	X	X	X	X	X	
PHYLUM ANNELIDA						
CLASS OLIGOCHAETA						
ORDER HAPLOTAXIDA						
FAMILY TUBIFICIDAE	X	X	X	X	X	X
FAMILY LUMBRICIDAE					X	X
FAMILY NAIDIDAE			X	X	X	X
CLASS HIRUDINEA						
ORDER RHYNCHOBDELLIDA						
FAMILY GLOSSIPHONIIDAE						
HELOBDELLA STAGNALIS				X		
PHYLUM MOLLUSCA						
CLASS GASTROPODA						
ORDER BASOMMATOPHORA						
FAMILY PHYSIDAE						
PHYSA			X	X		X
PHYLUM ARTHROPODA						
CLASS ARACHNIDA						
ORDER ACARINA			X			
CLASS INSECTA						
ORDER EPHEMEROPTERA						
FAMILY BAETIDAE						
BAETIS	X				X	X
FAMILY EPHEMERELLIDAE						
EPHEMERELLA (EPHEMERELLA)	X					
FAMILY TRICORYTHIDAE						
TRICORYTHODES	X	X				
ORDER COLEOPTERA						
FAMILY ELMIDAE						
OPTIOSERVUS		X	X			
ZAITZEVIA PARVULA					X	
FAMILY HALIPLIDAE						
BRYCHIUS					X	
FAMILY DYTISCIDAE						
AGABINUS	X					
ORDER DIPTERA						
FAMILY CERATOPOGONIDAE						
SUBFAMILY CERATOPOGONINAE	X	X	X			
FAMILY CHIRONOMIDAE					X	
SUBFAMILY TANYPODINAE					X	
TRIBE PENTANEURINI	X					
TRIBE MACROPELOPIINI	X		X			
SUBFAMILY ORTHOCLADIINAE						
TRIBES ORTHOCLADIINI AND METRIOCNE	X				X	X
SUBFAMILY CHIRONOMINAE						
TRIBE CHIRONOMINI	X					
TRIBE TANYTARSINI	X					X
FAMILY TIPULIDAE					X	
TIPULA	X				X	X

X = ORGANISM IDENTIFIED TO THIS TAXONOMIC LEVEL OBSERVED AT SAMPLING STATION

BENTHOS SPECIES LIST

CATHEDRAL BLUFFS SHALE OIL COMPANY
PICEANCE CREEK

SPECIES OCCURRENCE BY SAMPLING DATE AT STATION WP03
1982

TAXON	MAY	JUNE	JULY	AUG	SEPT	OCT
PHYLUM NEMATODA		X			X	
PHYLUM ANNELIDA						
CLASS OLIGOCHAETA						
ORDER HAPLOTAXIDA						
FAMILY TUBIFICIDAE	X	X		X	X	X
CLASS HIRUDINEA						
ORDER RHYNCHOBDELLIDA						
FAMILY GLOSSIPHONIIDAE						
HELOBDELLA STAGNALIS				X		
PHYLUM MOLLUSCA						
CLASS GASTROPODA						
ORDER BASOMMATOPHORA						
FAMILY PHYSIDAE						
PHYSA				X		X
CLASS BIVALVIA						
ORDER HETERODONTA						
FAMILY SPHAERIIDAE						
PISIDIUM						X
PHYLUM ARTHROPODA						
CLASS INSECTA						
ORDER EPHEMEROPTERA						
FAMILY TRICORYTHIDAE						
TRICORYTHODES	X	X				
ORDER COLEOPTERA						
FAMILY HALIPLIDAE						
BRYCHIUS					X	
ORDER DIPTERA						
FAMILY CHIRONOMIDAE						
SUBFAMILY TANYPODINAE					X	
SUBFAMILY ORTHOCLADIINAE						
TRIBES ORTHOCLADIINI AND METRIOCNE	X	X		X	X	X
SUBFAMILY CHIRONOMINAE						
TRIBE CHIRONOMINI	X					
TRIBE TANYTARSINI	X					

X = ORGANISM IDENTIFIED TO THIS TAXONOMIC LEVEL OBSERVED AT SAMPLING STATION

TABLE 2.5.2-2

BENTHOS DATA SHEET

CATHEDRAL BLUFFS SHALE OIL COMPANY
PICEANCE CREEK

SAMPLE SITE: WP01 - STEWART

SAMPLE DATE - 06-01-82
NUMBER OF REPLICATES - 3
SAMPLER SIZE - 929.0 CM2

CODE	TAXON	REPLICATE DESIGNATION A	B	C
TIPA	TIPULA	4	4	0
BAET	BAETIS	24	4	4
NEMA	PHYLUM NEMATODA	16	4	44
CERE	SUBFAMILY CERATOPOGONINAE	16	4	16
TUBY	FAMILY TUBIFICIDAE	364	64	188
TROM	TRIBES ORTHOCLADIINI AND METRIOCNEMIINI	16	12	56
TRIC	TRICORYTHODES	0	0	4
TIPS	HEXATOMA	0	0	4
EPEP	EPHEMERELLA (EPHEMERELLA)	0	0	4
CHIT	TRIBE CHIRONOMINI	0	0	4
HYSP	HYDROPSYCHE	0	0	4

SAMPLE SITE: WP02 - MIDDLE

SAMPLE DATE - 06-01-82
NUMBER OF REPLICATES - 3
SAMPLER SIZE - 929.0 CM2

CODE	TAXON	REPLICATE DESIGNATION A	B	C
TANT	TRIBE TANYTARSINI	4	16	0
NEMA	PHYLUM NEMATODA	4	12	16
CHIT	TRIBE CHIRONOMINI	4	0	0
TUBY	FAMILY TUBIFICIDAE	152	1600	184
TROM	TRIBES ORTHOCLADIINI AND METRIOCNEMIINI	12	36	20
TIPA	TIPULA	0	4	4
EPEP	EPHEMERELLA (EPHEMERELLA)	0	0	8
TRIC	TRICORYTHODES	0	0	4
BAET	BAETIS	0	0	4
CERE	SUBFAMILY CERATOPOGONINAE	0	0	8
PENT	TRIBE PENTANEURINI	0	0	4
AGBS	AGABINUS	0	0	4
MACR	TRIBE MACROPLEOPIINI	0	8	0

```
SAMPLE SITE: WP03 - HUNTER

SAMPLE DATE - 06-01-82
NUMBER OF REPLICATES - 3
SAMPLER SIZE -  929.0 CM2

------------------------------------------------------------------------------
                                                REPLICATE DESIGNATION
CODE   TAXON                                        A     B     C
------------------------------------------------------------------------------

TUBY   FAMILY TUBIFICIDAE                          88   264   772
TROM   TRIBES ORTHOCLADIINI AND METRIOCNEMIINI      4     8    16
TANT   TRIBE TANYTARSINI                            0     8     0
CHIT   TRIBE CHIRONOMINI                            0     4     0
TRIC   TRICORYTHODES                                0     0     8
------------------------------------------------------------------------------
```

```
BENTHOS DATA SHEET
------------------

CATHEDRAL BLUFFS SHALE OIL COMPANY
PICEANCE CREEK

SAMPLE STATION: WPC1 - STEWART

SAMPLE DATE - 06-30-82
NUMBER OF REPLICATES - 3
SAMPLER SIZE -  929.0 CM2

-----------------------------------------------------------------------------

                                                REPLICATE DESIGNATION
CODE   TAXON                                        A     B     C
-----------------------------------------------------------------------------

TIPA   TIPULA                                       8     0     0
TRIC   TRICORYTHODES                               32     0     0
NEMA   PHYLUM NEMATODA                              8     4    12
HEST   HELOBDELLA STAGNALIS                         4     0     0
OPTI   OPTIOSERVUS                                  8     4     0
TUBY   FAMILY TUBIFICIDAE                         216   152   196
NAID   FAMILY NAIDIDAE                              4     0     0
TRUM   TRIBES ORTHOCLADIINI AND METRIOCNEMINI       4     4     0
-----------------------------------------------------------------------------
-----------------------------------------------------------------------------


SAMPLE STATION: WPC2 - MIDDLE

SAMPLE DATE - 06-30-82
NUMBER OF REPLICATES - 3
SAMPLER SIZE -  929.0 CM2

-----------------------------------------------------------------------------

                                                REPLICATE DESIGNATION
CODE   TAXON                                        A     B     C
-----------------------------------------------------------------------------

TUBY   FAMILY TUBIFICIDAE                        2304  2656   160
NEMA   PHYLUM NEMATODA                              4     4     0
TRIC   TRICORYTHODES                                0     4     0
CERE   SUBFAMILY CERATOPOGONINAE                    0     0     4
OPTI   OPTIOSERVUS                                  0     0     4
-----------------------------------------------------------------------------
-----------------------------------------------------------------------------


SAMPLE STATION: WPC3 - HUNTER

SAMPLE DATE - 06-30-82
NUMBER OF REPLICATES - 3
SAMPLER SIZE -  929.0 CM2

-----------------------------------------------------------------------------

                                                REPLICATE DESIGNATION
CODE   TAXON                                        A     B     C
-----------------------------------------------------------------------------
```

```
TRIC   TRICORYTHODES                                  24     4    12
NEMA   PHYLUM NEMATODA                                12     4    12
TUBY   FAMILY TUBIFICIDAE                           1264   916   395
TROM   TRIBES ORTHOCLADIINI AND METRIOCNEMINI          6     0     0
-------------------------------------------------------------------------------
```

BENTHOS DATA SHEET

CATHEDRAL BLUFFS SHALE OIL COMPANY
PICEANCE CREEK

SAMPLE STATION: WP01 - STEWART

SAMPLE DATE - 07-29-82
NUMBER OF REPLICATES - 3
SAMPLER SIZE - 929.0 CM2

CODE	TAXON	REPLICATE DESIGNATION A	B	C
PHYS	PHYSA	0	16	8
OPTI	OPTIOSERVUS	0	8	0
ACAR	ORDER ACARINA	8	4	0
TUBY	FAMILY TUBIFICIDAE	528	1600	496
NEMA	PHYLUM NEMATODA	4	4	12
NAID	FAMILY NAIDIDAE	320	46	56
PISI	PISIDIUM	0	0	4

SAMPLE STATION: WP02 - MIDDLE

SAMPLE DATE - 07-29-82
NUMBER OF REPLICATES - 3
SAMPLER SIZE - 929.0 CM2

CODE	TAXON	REPLICATE DESIGNATION A	B	C
TUBY	FAMILY TUBIFICIDAE	1488	2472	1488
NEMA	PHYLUM NEMATODA	24	6	0
PHYS	PHYSA	32	0	16
ACAR	ORDER ACARINA	4	12	0
OPTI	OPTIOSERVUS	4	8	4
CERE	SUBFAMILY CERATOPOGONINAE	4	0	4
MACR	TRIBE MACROPLEOPIINI	4	0	0
NAID	FAMILY NAIDIDAE	432	720	384

```
BENTHOS DATA SHEET
------------------

CATHEDRAL BLUFFS SHALE OIL COMPANY
PICEANCE CREEK

SAMPLE STATION: WP01 - STEWART

SAMPLE DATE - 09-02-82
NUMBER OF REPLICATES - 3
SAMPLER SIZE -  929.0 CM2

------------------------------------------------------------------------------

                                                  REPLICATE DESIGNATION
CODE   TAXON                                          A     B     C
------------------------------------------------------------------------------

TUBY   FAMILY TUBIFICIDAE                            94    64    44
PHYS   PHYSA                                          0     4     4
NAID   FAMILY NAIDIDAE                                0     4     0
------------------------------------------------------------------------------
------------------------------------------------------------------------------


SAMPLE STATION: WP02 - MIDDLE

SAMPLE DATE - 09-02-82
NUMBER OF REPLICATES - 3
SAMPLER SIZE -  929.0 CM2

------------------------------------------------------------------------------

                                                  REPLICATE DESIGNATION
CODE   TAXON                                          A     B     C
------------------------------------------------------------------------------

PHYS   PHYSA                                          8     0     0
HEST   HELOBDELLA STAGNALIS                           4     0     0
TUBY   FAMILY TUBIFICIDAE                            54     4     4
NAID   FAMILY NAIDIDAE                                4     4     4
NEMA   PHYLUM NEMATODA                                0     0     4
------------------------------------------------------------------------------
------------------------------------------------------------------------------


SAMPLE STATION: WP03 - HUNTER

SAMPLE DATE - 09-02-82
NUMBER OF REPLICATES - 3
SAMPLER SIZE -  929.0 CM2

------------------------------------------------------------------------------

                                                  REPLICATE DESIGNATION
CODE   TAXON                                          A     B     C
------------------------------------------------------------------------------

TUBY   FAMILY TUBIFICIDAE                          1552   624   336
PHYS   PHYSA                                          4     8    36
HEST   HELOBDELLA STAGNALIS                           0     4     0
TROM   TRIBES ORTHOCLADIINI AND METRIOCNEMINI         0     0     4
```

```
BENTHOS DATA SHEET
------------------

CATHEDRAL BLUFFS SHALE OIL COMPANY
PICEANCE CREEK

SAMPLE STATION: WPO1 - STEWART

SAMPLE DATE - 10-04-82
NUMBER OF REPLICATES - 3
SAMPLER SIZE -  929.0 CM2

---------------------------------------------------------------------------

                                              REPLICATE OESIGNATION
COOE   TAXON                                      A     B     C
---------------------------------------------------------------------------

TUBY   FAMILY TUBIFICIDAE                       140    96    36
NAID   FAMILY NAIDIDAE                            8     8     0
BAET   BAETIS                                     8     4     8
TIPA   TIPULA                                     4     4     0
TROM   TRIBES ORTHOCLAOIINI AND METRIOCNEMIINI    4     4     4
TIPU   FAMILY TIPULIDAE                           4     4     8
NEMA   PHYLUM NEMATOOA                            0     8     0
LUMB   FAMILY LUMBRICIOAE                         0     4     0
ORMO   ORMOSIA                                    0     4     0
BATD   FAMILY BAETIDAE                            0     4     0
HEST   HELOBOELLA STAGNALIS                       0     4     0
---------------------------------------------------------------------------
---------------------------------------------------------------------------


SAMPLE STATION: WPO2 - MIODLE

SAMPLE DATE - 10-04-82
NUMBER OF REPLICATES - 3
SAMPLER SIZE -  929.0 CM2

---------------------------------------------------------------------------

                                              REPLICATE DESIGNATION
CODE   TAXON                                      A     8     C
---------------------------------------------------------------------------

LUMB   FAMILY LUMBRICIDAE                         8     0     0
TROM   TRIBES ORTHOCLADIINI ANO METRIOCNEMIINI   12     8     0
TIPA   TIPULA                                     8     4     4
BAET   BAETIS                                     4     0     0
ZAPA   ZAITZEVIA PARVULA                          4     0     0
BRYC   BRYCHIUS                                   4     0     0
TANY   SUBFAMILY TANYPOOINAE                     12     0     0
TIPU   FAMILY TIPULIDAE                           4     0     4
CHIF   FAMILY CHIRONOMIDAE                        4     0     0
TUBY   FAMILY TUBIFICIDAE                        32    40   100
NEMA   PHYLUM NEMATODA                            0     0     4
NAID   FAMILY NAIDIDAE                            0     0     4
---------------------------------------------------------------------------
---------------------------------------------------------------------------


SAMPLE STATION: WPO3 - HUNTER
SAMPLE DATE - 10-04-82
NUMBER OF REPLICATES - 3
SAMPLER SIZE -  929.0 CM2

----------------------------------------------------------------------------

                                             REPLICATE DESIGNATION
CODE   TAXON                                   A      B      C
----------------------------------------------------------------------------

TUBY   FAMILY TUBIFICIDAE                    1156   228   1548
TROM   TRIBES ORTHOCLADIINI AND METRIOCNEMIINI  4     4      0
NEMA   PHYLUM NEMATODA                          4     4      0
TANY   SUBFAMILY TANYPODINAE                    0     4      0
BRYC   BRYCHIUS                                 0     0      4
----------------------------------------------------------------------------
```

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BENTHOS DATA SHEET
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CATHEDRAL BLUFFS SHALE OIL COMPANY
PICEANCE CREEK

SAMPLE STATION: WP01 - STEWART

SAMPLE DATE - 11-03-82
NUMBER OF REPLICATES - 3
SAMPLER SIZE - 929.0 CM2

-----------------------------------------------------------------------------

                                                   REPLICATE DESIGNATION
CODE   TAXON                                          A      B      C
-----------------------------------------------------------------------------

TUBY   FAMILY TUBIFICIDAE                            56    204    232
NEMA   PHYLUM NEMATODA                                8      0      4
TANY   SUBFAMILY TANYPODINAE                          4      0      4
TROM   TRIBES ORTHOCLADIINI AND METRIOCNEMIINI      136    224    104
ZAPA   ZAITZEVIA PARVULA                              4      4      0
TIPA   TIPULA                                        16     16      8
NAID   FAMILY NAIDIDAE                                0     24      0
BAET   BAETIS                                         0      4      4
TANT   TRIBE TANYTARSINI                              0      4      0
EMPP   FAMILY EMPIDIDAE                               0      4      0
-----------------------------------------------------------------------------
-----------------------------------------------------------------------------


SAMPLE STATION: WP02 - MIDDLE

SAMPLE DATE - 11-03-82
NUMBER OF REPLICATES - 3
SAMPLER SIZE - 929.0 CM2

-----------------------------------------------------------------------------

                                                   REPLICATE DESIGNATION
CODE   TAXON                                          A      B      C
-----------------------------------------------------------------------------

TROM   TRIBES ORTHOCLADIINI AND METRIOCNEMIINI       52     20    156
TUBY   FAMILY TUBIFICIDAE                            12     20     32
NAID   FAMILY NAIDIDAE                                0      4      4
TIPA   TIPULA                                         0      4     16
LUMB   FAMILY LUMBRICIDAE                             0      4      4
PHYS   PHYSA                                          0      4     20
TANT   TRIBE TANYTARSINI                              0      4      4
BAET   BAETIS                                         0      0      4
-----------------------------------------------------------------------------
-----------------------------------------------------------------------------


SAMPLE STATION: WP03 - HUNTER

SAMPLE DATE - 11-03-82
NUMBER OF REPLICATES - 3
SAMPLER SIZE - 929.0 CM2
```

CODE	TAXON	REPLICATE DESIGNATION A	B	C
TUBY	FAMILY TUBIFICIDAE	152	256	144
TROM	TRIBES ORTHOCLADIINI AND METRIOCNEMIINI	4	0	16
PISI	PISIDIUM	4	0	0
PHYS	PHYSA	0	4	0

TABLE 2.5.2-3

Table 2.5.2-3

```
BENTHOS (MACROINVERTEBRATES) DENSITY AND DIVERSITY CALCULATIONS
---------------------------------------------------------------

CATHEDRAL BLUFFS SHALE OIL COMPANY
PICEANCE CREEK

SAMPLE STATION: WP01 - STEWART
NUMBER OF REPLICATES - 3
SAMPLE DATE - 06-01-82

-------------------------------------------------------------------------------------------------------------------
                                                       DENSITY(#/M2)                                PERCENT
 TAXON                                          REP 1     REP 2     REP 3     MEAN      S.D.    RELATIVE ABUNDANCE
-------------------------------------------------------------------------------------------------------------------

PHYLUM NEMATODA                                 172.2      43.1     473.6     229.6     221.0          7.4
PHYLUM ANNELIDA
 CLASS OLIGOCHAETA
  ORDER HAPLOTAXIDA
    FAMILY TUBIFICIDAE                         3918.2     688.9    2023.7    2210.3    1622.7         71.6
PHYLUM ARTHROPODA
 CLASS INSECTA
  ORDER EPHEMEROPTERA
    FAMILY BAETIDAE
        BAETIS                                  258.3      43.1      43.1     114.8     124.3          3.7
    FAMILY EPHEMERELLIDAE
        EPHEMERELLA (EPHEMERELLA)                  .0        .0      43.1      14.4      24.9           .5
    FAMILY TRICORYTHIDAE
        TRICORYTHODES                              .0        .0      43.1      14.4      24.9           .5
  ORDER TRICHOPTERA
    FAMILY HYDROPSYCHIDAE
        HYDROPSYCHE                                .0        .0      43.1      14.4      24.9           .5
  ORDER DIPTERA
    FAMILY CERATOPOGONIDAE
     SUBFAMILY CERATOPOGONINAE                  172.2      43.1     172.2     129.2      74.6          4.2
    FAMILY CHIRONOMIDAE
     SUBFAMILY ORTHOCLADIINAE
      TRIBES ORTHOCLADIINI AND METRIOCNEMIINI   172.2     129.2     602.8     301.4     261.9          9.8
     SUBFAMILY CHIRONOMINAE
      TRIBE CHIRONOMINI                            .0        .0      43.1      14.4      24.9           .5
    FAMILY TIPULIDAE
        HEXATOMA                                   .0        .0      43.1      14.4      24.9           .5
        TIPULA                                   43.1      43.1        .0      28.7      24.9           .9

 TOTAL                                         4736.3     990.3    3530.7    3085.8    1912.2        100.0

DIVERSITY INDEX CALCULATIONS
----------------------------

SHANNON INDEX - 1.083
VARIANCE      -  .0095
MAXIMUM INDEX - 2.398
EVENNESS      -  .452
NO OF TAXA    -    11

-------------------------------------------------------------------------------------------------------------------


SAMPLE STATION: WP02 - MIDDLE
NUMBER OF REPLICATES - 3
```

```
SAMPLE DATE - 05-01-82

------------------------------------------------------------------------------------------------------------
                                                             DENSITY(#/M2)                        PERCENT
 TAXON                                             REP 1    REP 2     REP 3     MEAN     S.D.   RELATIVE ABUNDANCE
------------------------------------------------------------------------------------------------------------

PHYLUM NEMATODA                                     43.1    129.2     172.2    114.8     65.8          1.5
PHYLUM ANNELIDA
 CLASS OLIGOCHAETA
  ORDER HAPLOTAXIDA
    FAMILY TUBIFICIDAE                            1636.2  17222.8    1980.6   6946.5   8901.2         91.8
PHYLUM ARTHROPODA
 CLASS INSECTA
  ORDER EPHEMEROPTERA
    FAMILY BAETIDAE
       BAETIS                                         .0       .0      43.1     14.4     24.9           .2
    FAMILY EPHEMERELLIDAE
       EPHEMERELLA (EPHEMERELLA)                      .0       .0      86.1     28.7     49.7           .4
    FAMILY TRICORYTHIDAE
       TRICORYTHODES                                  .0       .0      43.1     14.4     24.9           .2
  ORDER COLEOPTERA
    FAMILY DYTISCIDAE
       AGABINUS                                       .0       .0      43.1     14.4     24.9           .2
  ORDER DIPTERA
    FAMILY CERATOPOGONIDAE
     SUBFAMILY CERATOPOGONINAE                        .0       .0      86.1     28.7     49.7           .4
    FAMILY CHIRONOMIDAE
     SUBFAMILY TANYPODINAE
      TRIBE PENTANEURINI                              .0       .0      43.1     14.4     24.9           .2
      TRIBE MACROPLEOPIINI                            .0     86.1        .0     28.7     49.7           .4
     SUBFAMILY ORTHOCLADIINAE
      TRIBES ORTHOCLADIINI AND METRIOCNEMIINI      129.2    387.5     215.3    244.0    131.5          3.2
     SUBFAMILY CHIRONOMINAE
      TRIBE CHIRONOMINI                             43.1       .0        .0     14.4     24.9           .2
      TRIBE TANYTARSINI                             43.1    172.2        .0     71.8     89.6           .9
    FAMILY TIPULIDAE
       TIPULA                                         .0     43.1      43.1     28.7     24.9           .4

  TOTAL                                           1894.5  18040.9    2755.7   7563.7   9083.7        100.0

DIVERSITY INDEX CALCULATIONS
----------------------------

SHANNON INDEX -  .441
VARIANCE      -  .0002
MAXIMUM INDEX - 2.565
EVENNESS      -  .172
NO OF TAXA    -    13

------------------------------------------------------------------------------------------------------------


SAMPLE STATION: WP03 - HUNTER
NUMBER OF REPLICATES - 3
SAMPLE DATE - 06-01-82

------------------------------------------------------------------------------------------------------------
                                                             DENSITY(#/M2)                        PERCENT
 TAXON                                             REP 1    REP 2     REP 3     MEAN     S.D.   RELATIVE ABUNDANCE
------------------------------------------------------------------------------------------------------------
```

```
PHYLUM ANNELIDA
 CLASS OLIGOCHAETA
  ORDER HAPLOTAXIDA
    FAMILY TUBIFICIDAE                                 947.3    2841.8    8310.0   4033.0   3823.2          95.9
PHYLUM ARTHROPODA
 CLASS INSECTA
  ORDER EPHEMEROPTERA
    FAMILY TRICORYTHIDAE
       TRICORYTHODES                                      .0        .0      86.1     28.7     49.7            .7
  ORDER DIPTERA
    FAMILY CHIRONOMIDAE
      SUBFAMILY ORTHOCLADIINAE
       TRIBES ORTHOCLADIINI AND METRIOCNEMIINI          43.1      86.1     172.2    100.5     65.8           2.4
      SUBFAMILY CHIRONOMINAE
       TRIBE CHIRONOMINI                                  .0      43.1        .0     14.4     24.9            .3
       TRIBE TANYTARSINI                                  .0      86.1        .0     28.7     49.7            .7

  TOTAL                                                990.3    3057.1    8568.4   4205.2   3917.3         100.0

DIVERSITY INDEX CALCULATIONS
----------------------------

SHANNON INDEX -  .217
VARIANCE      -  .0002
MAXIMUM INDEX - 1.609
EVENNESS      -  .135
NO OF TAXA    -     5

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BENTHOS (MACROINVERTEBRATES) DENSITY AND DIVERSITY CALCULATIONS
---------------------------------------------------------------

CATHEDRAL BLUFF, SHALE OIL COMPANY
PICEANCE CREEK

SAMPLE STATION: WP01 - STEWART
NUMBER OF REPLICATES - 3
SAMPLE DATE - 06-30-82

----------------------------------------------------------------------------------------------------------------
                                                              DENSITY(#/M2)                          PERCENT
 TAXON                                              REP 1    REP 2    REP 3     MEAN     S.D.   RELATIVE ABUNDANCE
----------------------------------------------------------------------------------------------------------------

PHYLUM NEMATODA                                      86.1     43.1    129.2     86.1     43.1          3.7
PHYLUM ANNELIDA
 CLASS OLIGOCHAETA
  ORDER HAPLOTAXIDA
    FAMILY TUBIFICIDAE                             2325.1   1636.2   2109.8   2023.7    352.4         86.0
    FAMILY NAIDIDAE                                  43.1       .0       .0     14.4     24.9           .6
 CLASS HIRUDINEA
  ORDER RHYNCHOBDELLIDA
    FAMILY GLOSSIPHONIIDAE
       HELOBDELLA STAGNALIS                          43.1       .0       .0     14.4     24.9           .6
PHYLUM ARTHROPODA
 CLASS INSECTA
  ORDER EPHEMEROPTERA
    FAMILY TRICORYTHIDAE
       TRICORYTHODES                                344.5       .0       .0    114.8    198.9          4.9
  ORDER COLEOPTERA
    FAMILY ELMIDAE
       OPTIOSERVUS                                   86.1     43.1       .0     43.1     43.1          1.8
  ORDER DIPTERA
    FAMILY CHIRONOMIDAE
     SUBFAMILY ORTHOCLADIINAE
      TRIBES ORTHOCLADIINI AND METRIOCNEMIINI        43.1     43.1       .0     28.7     24.9          1.2
    FAMILY TIPULIDAE
       TIPULA                                        86.1       .0       .0     28.7     49.7          1.2

  TOTAL                                            3057.1   1765.3   2239.0   2353.8    653.5        100.0

DIVERSITY INDEX CALCULATIONS
----------------------------

SHANNON INDEX -  .641
VARIANCE      -  .0007
MAXIMUM INDEX - 2.079
EVENNESS      -  .308
NO OF TAXA    -    8

----------------------------------------------------------------------------------------------------------------


SAMPLE STATION: WP02 - MIDDLE
NUMBER OF REPLICATES - 3
SAMPLE DATE - 06-30-82

----------------------------------------------------------------------------------------------------------------
                                                              DENSITY(#/M2)                          PERCENT
 TAXON                                                  REP 1     REP 2     REP 3     MEAN      S.D.    RELATIVE ABUNDANCE
-------------------------------------------------------------------------------------------------------------------------

PHYLUM NEMATODA                                          43.1      43.1        .0      28.7      24.9           .2
PHYLUM ANNELIDA
 CLASS OLIGOCHAETA
  ORDER HAPLOTAXIDA
    FAMILY TUBIFICIDAE                                24800.9   28589.9    1722.3   18371.0   14542.2         99.6
PHYLUM ARTHROPODA
 CLASS INSECTA
  ORDER EPHEMEROPTERA
    FAMILY TRICORYTHIDAE
       TRICORYTHODES                                       .0      43.1        .0      14.4      24.9           .1
  ORDER COLEOPTERA
    FAMILY ELMIDAE
       OPTIOSERVUS                                         .0        .0      43.1      14.4      24.9           .1
  ORDER DIPTERA
    FAMILY CERATOPOGONIDAE
      SUBFAMILY CERATOPOGONINAE                            .0        .0      43.1      14.4      24.9           .1

  TOTAL                                               24843.9   28676.0    1808.4   18442.8   14532.7        100.0

DIVERSITY INDEX CALCULATIONS
----------------------------

SHANNON INDEX -  .031
VARIANCE      -  .0000
MAXIMUM INDEX - 1.609
EVENNESS      -  .019
NO OF TAXA    -     5
-------------------------------------------------------------------------------------------------------------------------



SAMPLE STATION: 4P03 - HUNTER
NUMBER OF REPLICATES - 3
SAMPLE DATE - 06-30-82

-------------------------------------------------------------------------------------------------------------------------
                                                             DENSITY(#/M2)                              PERCENT
 TAXON                                                  REP 1     REP 2     REP 3     MEAN      S.D.    RELATIVE ABUNDANCE
-------------------------------------------------------------------------------------------------------------------------

PHYLUM NEMATODA                                         129.2      43.1     129.2     100.5      49.7          1.1
PHYLUM ANNELIDA
 CLASS OLIGOCHAETA
  ORDER HAPLOTAXIDA
    FAMILY TUBIFICIDAE                                13606.0    9860.1    4251.9    9239.3    4707.9         97.1
PHYLUM ARTHROPODA
 CLASS INSECTA
  ORDER EPHEMEROPTERA
    FAMILY TRICORYTHIDAE
       TRICORYTHODES                                    258.3      43.1     129.2     143.5     108.4          1.5
  ORDER DIPTERA
    FAMILY CHIRONOMIDAE
      SUBFAMILY ORTHOCLADIINAE
       TRIBES ORTHOCLADIINI AND METRIOCNEMIINI           86.1        .0        .0      28.7      49.7           .3

  TOTAL                                               14079.7    9946.2    4510.2    9512.0    4799.5        100.0

DIVERSITY INDEX CALCULATIONS
```

```
SHANNON INDEX -  .157
VARIANCE      -  .0001
MAXIMUM INDEX - 1.386
EVENNESS      -  .113
NO OF TAXA    -     4
```

```
ENTHOS (MACROINVERTEBRATES) DENSITY AND DIVERSITY CALCULATIONS
--------------------------------------------------------------

ATHEDRAL BLUFFS SHALE OIL COMPANY
ICEANCE CREEK

AMPLE STATION: WP01 - STEWART
UMBER OF REPLICATES - 3
AMPLE DATE - 07-29-82

-----------------------------------------------------------------------------------------------------------
                                              DENSITY(#/M2)                                PERCENT
TAXON                                 REP 1     REP 2     REP 3     MEAN      S.D.    RELATIVE ABUNDANCE
-----------------------------------------------------------------------------------------------------------

HYLUM NEMATODA                         43.1      43.1     129.2      71.8      49.7            .6
HYLUM ANNELIDA
CLASS OLIGOCHAETA
 ORDER HAPLOTAXIDA
   FAMILY TUBIFICIDAE                5683.5   17222.8    5339.1    9415.1    6763.8          84.2
   FAMILY NAIDIDAE                   3444.6     516.7     602.8    1521.3    1666.1          13.6
HYLUM MOLLUSCA
CLASS GASTROPODA
 ORDER BASSOMATOPHORA
   FAMILY PHYSIDAE
      PHYSA                              .0     172.2      86.1      86.1      86.1            .8
CLASS BIVALVIA
 ORDER HETERODONTA
   FAMILY SPHAERIIDAE
      PISIDIUM                           .0        .0      43.1      14.4      24.9            .1
HYLUM ARTHROPODA
CLASS ARACHNIDA
 ORDER ACARINA                         86.1      43.1        .0      43.1      43.1            .4
CLASS INSECTA
 ORDER COLEOPTERA
   FAMILY ELMIDAE
      OPTIOSERVUS                        .0      86.1        .0      28.7      49.7            .3

 TOTAL                               9257.3   18084.0    6200.2   11180.5    6170.9         100.0

DIVERSITY INDEX CALCULATIONS
----------------------------

SHANNON INDEX -  .531
VARIANCE      - .0001
MAXIMUM INDEX - 1.946
EVENNESS      -  .273
NO OF TAXA    -    7

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SAMPLE STATION: WP02 - MIDDLE
NUMBER OF REPLICATES - 3
SAMPLE DATE - 07-29-82

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                                              DENSITY(#/M2)                                PERCENT
TAXON                                 REP 1     REP 2     REP 3     MEAN      S.D.    RELATIVE ABUNDANCE
-----------------------------------------------------------------------------------------------------------
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PHYLUM NEMATODA                          258.3     86.1       .0    114.8   131.5          .5
PHYLUM ANNELIDA
 CLASS OLIGOCHAETA
  ORDER HAPLOTAXIDA
    FAMILY TUBIFICIDAE                 16017.2  26609.3  16017.2  19547.9  6115.3        76.6
    FAMILY NAIDIDAE                     4650.2   7750.3   4133.5   5511.3  1956.1        21.6
PHYLUM MOLLUSCA
 CLASS GASTROPODA
  ORDER BASSOMATOPHORA
    FAMILY PHYSIDAE
       PHYSA                             344.5       .0    172.2    172.2   172.2          .7
PHYLUM ARTHROPODA
 CLASS ARACHNIDA
  ORDER ACARINA                           43.1    129.2       .0     57.4    65.8          .2
 CLASS INSECTA
  ORDER COLEOPTERA
    FAMILY ELMIDAE
       OPTIOSERVUS                        43.1     86.1     43.1     57.4    24.9          .2
  ORDER DIPTERA
    FAMILY CERATOPOGONIDAE
     SUBFAMILY CERATOPOGONINAE            43.1       .0     43.1     28.7    24.9          .1
    FAMILY CHIRONOMIDAE
     SUBFAMILY TANYPODINAE
      TRIBE MACROPLEOPIINI                43.1       .0       .0     14.4    24.9          .1

  TOTAL                                21442.4  34660.9  20409.0  25504.1  7946.8       100.0


DIVERSITY INDEX CALCULATIONS
----------------------------

SHANNON INDEX  -   .632
VARIANCE       -   .0000
MAXIMUM INDEX  - 2.079
EVENNESS       -   .304
NO OF TAXA     -     8

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BENTHOS (MACROINVERTEBRATES) DENSITY AND DIVERSITY CALCULATIONS
---------------------------------------------------------------

CATHEDRAL BLUFFS SHALE OIL COMPANY
PICEANCE CREEK

SAMPLE STATION: NPOL - STEWART
NUMBER OF REPLICATES - 3
SAMPLE DATE - 09-02-12

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                                                              DENSITY(#/M2)                             PERCENT
 TAXON                                               REP 1     REP 2     REP 3     MEAN      S.D.   RELATIVE ABUNDANCE
------------------------------------------------------------------------------------------------------------------

PHYLUM ANNELIDA
 CLASS OLIGOCHAETA
  ORDER HAPLOTAXIDA
    FAMILY TUBIFICIDAE                               904.2     688.9     473.6     688.9     215.3          94.1
    FAMILY NAIDIDAE                                     .0      43.1        .0      14.4      24.9           2.0
PHYLUM MOLLUSCA
 CLASS GASTROPODA
  ORDER BASOMMATOPHORA
    FAMILY PHYSIDAE
       PHYSA                                            .0      43.1      43.1      28.7      24.9           3.9

  TOTAL                                              904.2     775.0     516.7     732.0     197.3         100.0

DIVERSITY INDEX CALCULATIONS
----------------------------

SHANNON INDEX    -    .251
VARIANCE         -    .0009
MAXIMUM INDEX    -   1.099
EVENNESS         -    .236
NO OF TAXA       -      3

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SAMPLE STATION: [illegible] - MIDDLE
NUMBER OF REPLICATES - 3
SAMPLE DATE - 09-02-12

------------------------------------------------------------------------------------------------------------------
                                                              DENSITY(#/M2)                             PERCENT
 TAXON                                               REP 1     REP 2     REP 3     MEAN      S.D.   RELATIVE ABUNDANCE
------------------------------------------------------------------------------------------------------------------

PHYLUM NEMATODA                                         .0        .0      43.1      14.4      24.9           4.0
PHYLUM ANNELIDA
 CLASS OLIGOCHAETA
  ORDER HAPLOTAXIDA
    FAMILY TUBIFICIDAE                               688.9      43.1      43.1     258.3     372.9          72.0
    FAMILY NAIDIDAE                                   43.1      43.1      43.1      43.1        .0          12.0
 CLASS HIRUDINEA
  ORDER RHYNCHOBDELLIDA
    FAMILY GLOSSIPHONIIDAE
       HELOBDELLA STAGNALIS                           43.1        .0        .0      14.4      24.9           4.0
PHYLUM MOLLUSCA
```

-111-

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 CLASS GASTROPODA
  ORDER BASSOMMATOPHORA
    FAMILY PHYSIDAE
       PHYSA                                     86.1       .0       .0    28.7    49.7          8.0

  TOTAL                                         861.1     86.1    129.2   358.8   435.6        100.0


DIVERSITY INDEX CALCULATIONS
----------------------------

SHANNON INDEX  -  .951
VARIANCE       -  .0029
MAXIMUM INDEX  - 1.609
EVENNESS       -  .591
NO OF TAXA     -     5

------------------------------------------------------------------------------------------------------------


SAMPLE STATION: WP03 - HUNTER
NUMBER OF REPLICATES - 3
SAMPLE DATE - 09-02-82

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                                                      DENSITY(#/M2)                                PERCENT
 TAXON                                          REP 1    REP 2    REP 3    MEAN    S.D.   RELATIVE ABUNDANCE
------------------------------------------------------------------------------------------------------------

PHYLUM ANNELIDA
 CLASS OLIGOCHAETA
  ORDER HAPLOTAXIDA
    FAMILY TUBIFICIDAE                        16706.1   6716.9   3616.8  9013.3  6840.2         97.8
 CLASS HIRUDINEA
  ORDER RHYNCHOBDELLIDA
    FAMILY GLOSSIPHONIIDAE
       HELOBDELLA STAGNALIS                        .0     43.1       .0    14.4    24.9           .2
PHYLUM MOLLUSCA
 CLASS GASTROPODA
  ORDER BASSOMATOPHORA
    FAMILY PHYSIDAE
       PHYSA                                     43.1     86.1    387.5   172.2   187.7          1.9
PHYLUM ARTHROPODA
 CLASS INSECTA
  ORDER DIPTERA
    FAMILY CHIRONOMIDAE
      SUBFAMILY ORTHOCLADIINAE
       TRIBES ORTHOCLADIINI AND METRIOCNEMIINI     .0       .0     43.1    14.4    24.9           .2

  TOTAL                                       16749.2   6846.1   4047.4  9214.2  6673.8        100.0


DIVERSITY INDEX CALCULATIONS
----------------------------

SHANNON INDEX  -  .116
VARIANCE       -  .0000
MAXIMUM INDEX  - 1.386
EVENNESS       -  .084
NO OF TAXA     -     4

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BENTHOS (MACROINVERTEBRATES) DENSITY AND DIVERSITY CALCULATIONS

CATHEDRAL BLUFFS SHALE OIL COMPANY
PICEANCE CREEK

SAMPLE STATION: WP01 - STEWART
NUMBER OF REPLICATES - 3
SAMPLE DATE - 10-04-82

TAXON	DENSITY(#/M2) REP 1	REP 2	REP 3	MEAN	S.D.	PERCENT RELATIVE ABUNDANCE
PHYLUM NEMATODA	.0	86.1	.0	28.7	49.7	2.2
PHYLUM ANNELIDA						
CLASS OLIGOCHAETA						
ORDER HAPLOTAXIDA						
FAMILY TUBIFICIDAE	1507.0	1033.4	387.5	976.0	561.9	73.9
FAMILY LUMBRICIDAE	.0	43.1	.0	14.4	24.9	1.1
FAMILY NAIDIDAE	86.1	86.1	.0	57.4	49.7	4.3
CLASS HIRUDINEA						
ORDER RHYNCHOBDELLIDA						
FAMILY GLOSSIPHONIIDAE						
HELOBDELLA STAGNALIS	.0	43.1	.0	14.4	24.9	1.1
PHYLUM ARTHROPODA						
CLASS INSECTA						
ORDER EPHEMEROPTERA						
FAMILY BAETIDAE	.0	43.1	.0	14.4	24.9	1.1
BAETIS	86.1	43.1	86.1	71.8	24.9	5.4
ORDER DIPTERA						
FAMILY CHIRONOMIDAE						
SUBFAMILY ORTHOCLADIINAE						
TRIBES ORTHOCLADIINI AND METRIOCNEMIINI	43.1	43.1	43.1	43.1	.0	3.3
FAMILY TIPULIDAE	43.1	43.1	86.1	57.4	24.9	4.3
ORMOSIA	.0	43.1	.0	14.4	24.9	1.1
TIPULA	43.1	43.1	.0	28.7	24.9	2.2
TOTAL	1808.4	1550.1	602.8	1320.4	634.8	100.0

DIVERSITY INDEX CALCULATIONS

SHANNON INDEX - 1.129
VARIANCE - .0015
MAXIMUM INDEX - 2.398
EVENNESS - .471
NO OF TAXA - 11

SAMPLE STATION: WP02 - MIDDLE
NUMBER OF REPLICATES - 3
SAMPLE DATE - 10-04-82

TAXON	DENSITY(#/M2) REP 1	REP 2	REP 3	MEAN	S.D.	PERCENT RELATIVE ABUNDANCE

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PHYLUM NEMATODA                                       .0        .0      43.1     14.4     24.9          1.5
PHYLUM ANNELIDA
 CLASS OLIGOCHAETA
  ORDER HAPLOTAXIDA
    FAMILY TUBIFICIDAE                             344.5     430.6    1076.4    617.2    400.1         66.2
    FAMILY LUMBRICIDAE                              86.1        .0        .0     28.7     49.7          3.1
    FAMILY NAIDIDAE                                   .0        .0      43.1     14.4     24.9          1.5
PHYLUM ARTHROPODA
 CLASS INSECTA
  ORDER EPHEMEROPTERA
    FAMILY BAETIDAE
       BAETIS                                       43.1        .0        .0     14.4     24.9          1.5
  ORDER COLEOPTERA
    FAMILY ELMIDAE
       ZAITZEVIA PARVULA                            43.1        .0        .0     14.4     24.9          1.5
    FAMILY HALIPLIDAE
       BRYCHIUS                                     43.1        .0        .0     14.4     24.9          1.5
  ORDER DIPTERA
    FAMILY CHIRONOMIDAE                             43.1        .0        .0     14.4     24.9          1.5
      SUBFAMILY TANYPODINAE                        129.2        .0        .0     43.1     74.6          4.6
      SUBFAMILY ORTHOCLADIINAE
       TRIBES ORTHOCLADIINI AND METRIOCNEMIINI     129.2      86.1        .0     71.8     65.8          7.7
    FAMILY TIPULIDAE                                43.1        .0      43.1     28.7     24.9          3.1
       TIPULA                                       86.1      43.1      43.1     57.4     24.9          6.2

  TOTAL                                            990.3     559.7    1248.7    932.9    348.0        100.0


DIVERSITY INDEX CALCULATIONS
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SHANNON INDEX - 1.384
VARIANCE      -  .0021
MAXIMUM INDEX - 2.485
EVENNESS      -  .557
NO OF TAXA    -    12

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SAMPLE STATION: WP03 - HUNTER
NUMBER OF REPLICATES - 3
SAMPLE DATE - 10-04-82

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                                                          DENSITY(#/M2)                             PERCENT
 TAXON                                             REP 1     REP 2     REP 3     MEAN     S.D.   RELATIVE ABUNDANCE
------------------------------------------------------------------------------------------------------------------------

PHYLUM NEMATODA                                     43.1      43.1        .0     28.7     24.9           .3
PHYLUM ANNELIDA
 CLASS OLIGOCHAETA
  ORDER HAPLOTAXIDA
    FAMILY TUBIFICIDAE                           12443.5    2454.3   16663.1  10520.3   7297.0         99.2
PHYLUM ARTHROPODA
 CLASS INSECTA
  ORDER COLEOPTERA
    FAMILY HALIPLIDAE
       BRYCHIUS                                       .0        .0      43.1     14.4     24.9           .1
  ORDER DIPTERA
    FAMILY CHIRONOMIDAE
```

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   SUBFAMILY TANYPODINAE                                      .0      43.1        .0    14.4    24.9            .1
   SUBFAMILY ORTHOCLADIINAE
    TRIBES ORTHOCLADIINI AND METRIOCNEMIINI                 43.1      43.1        .0    28.7    24.9            .3

 TOTAL                                                   12529.6    2583.4   16706.1 10606.4  7255.1         100.0

DIVERSITY INDEX CALCULATIONS
----------------------------

SHANNON INDEX -  .058
VARIANCE      -  .0000
MAXIMUM INDEX - 1.609
EVENNESS      -  .036
NO OF TAXA    -     5

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BENTHOS (MACROINVERTEBRATES) DENSITY AND DIVERSITY CALCULATIONS
---------------------------------------------------------------

CATHEDRAL BLUFFS SHALE OIL COMPANY
PICEANCE CREEK

SAMPLE STATION: WP01 - STEWART
NUMBER OF REPLICATES - 3
SAMPLE DATE - 11-03-82

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                                                       DENSITY(#/M2)                                 PERCENT
 TAXON                                       REP 1     REP 2     REP 3     MEAN      S.D.     RELATIVE ABUNDANCE
------------------------------------------------------------------------------------------------------------------------

PHYLUM NEMATODA                               86.1        .0      43.1      43.1      43.1          1.1
PHYLUM ANNELIDA
 CLASS OLIGOCHAETA
  ORDER HAPLOTAXIDA
     FAMILY TUBIFICIDAE                      732.0    2195.9    2497.3    1808.4     944.3         46.0
     FAMILY NAIDIDAE                            .0     258.3        .0      86.1     149.2          2.2
PHYLUM ARTHROPODA
 CLASS INSECTA
  ORDER EPHEMEROPTERA
     FAMILY BAETIDAE
        BAETIS                                  .0      43.1      43.1      28.7      24.9           .7
  ORDER COLEOPTERA
     FAMILY ELMIDAE
        ZAITZEVIA PARVULA                     43.1      43.1        .0      28.7      24.9           .7
  ORDER DIPTERA
     FAMILY CHIRONOMIDAE
      SUBFAMILY TANYPODINAE                   43.1        .0      43.1      28.7      24.9           .7
      SUBFAMILY ORTHOCLADIINAE
       TRIBE ORTHOCLADIINI AND METRIOCNEMINI 1679.2    2411.2    1119.5    1736.6     647.8         44.2
      SUBFAMILY CHIRONOMINAE
       TRIBE TANYTARSINI                        .0      43.1        .0      14.4      24.9           .4
     FAMILY EMPIDIDAE                           .0      43.1        .0      14.4      24.9           .4
     FAMILY TIPULIDAE
        TIPULA                               172.2     172.2      86.1     143.5      49.7          3.6

  TOTAL                                     2755.7    5209.9    3832.1    3932.5    1230.2        100.0

DIVERSITY INDEX CALCULATIONS
----------------------------

SHANNON INDEX  - 1.121
VARIANCE       -  .0003
MAXIMUM INDEX  - 2.303
EVENNESS       -  .487
NO OF TAXA     -    10

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SAMPLE STATION: WP02 - MIDDLE
NUMBER OF REPLICATES - 3
SAMPLE DATE - 11-03-82

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                                                       DENSITY(#/M2)                                 PERCENT
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TAXON                                                          REP 1    REP 2    REP 3    MEAN     S.D.    RELATIVE ABUNDANCE
---------------------------------------------------------------------------------------------------------------------------------

PHYLUM ANNELIDA
 CLASS OLIGOCHAETA
  ORDER HAPLOTAXIDA
    FAMILY TUBIFICIDAE                                         129.2    215.3    344.5    229.6    108.4          17.6
    FAMILY LUMBRICIDAE                                            .0     43.1     43.1     28.7     24.9           2.2
    FAMILY NAIDIDAE                                               .0     43.1     43.1     28.7     24.9           2.2
PHYLUM MOLLUSCA
 CLASS GASTROPODA
  ORDER BASSOMATOPHORA
    FAMILY PHYSIDAE
      PHYSA                                                       .0     43.1    215.3     86.1    113.9           6.6
PHYLUM ARTHROPODA
 CLASS INSECTA
  ORDER EPHEMEROPTERA
    FAMILY BAETIDAE
      BAETIS                                                      .0       .0     43.1     14.4     24.9           1.1
  ORDER DIPTERA
    FAMILY CHIRONOMIDAE
      SUBFAMILY ORTHOCLADIINAE
       TRIBES ORTHOCLADIINI AND METRIOCNEMIINI                 559.7    215.3   1679.2    818.1    765.4          62.6
      SUBFAMILY CHIRONOMINAE
       TRIBE TANYTARSINI                                          .0     43.1     43.1     28.7     24.9           2.2
    FAMILY TIPULIDAE
      TIPULA                                                      .0     43.1    172.2     71.8     89.6           5.5

  TOTAL                                                        688.9    645.9   2583.4   1306.1   1105.4         100.0

DIVERSITY INDEX CALCULATIONS
----------------------------

SHANNON INDEX - 1.239
VARIANCE      -  .0010
MAXIMUM INDEX - 2.079
EVENNESS      -  .595
NO OF TAXA    -     8

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SAMPLE STATION: WP03 - HUNTER
NUMBER OF REPLICATES - 3
SAMPLE DATE - 11-03-82

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                                                                         DENSITY(#/M2)                          PERCENT
TAXON                                                          REP 1    REP 2    REP 3    MEAN     S.D.    RELATIVE ABUNDANCE
---------------------------------------------------------------------------------------------------------------------------------

PHYLUM ANNELIDA
 CLASS OLIGOCHAETA
  ORDER HAPLOTAXIDA
    FAMILY TUBIFICIDAE                                        1636.2   2755.7   1550.1   1980.6    672.6          95.2
PHYLUM MOLLUSCA
 CLASS GASTROPODA
  ORDER BASSOMATOPHORA
    FAMILY PHYSIDAE
      PHYSA                                                       .0     43.1       .0     14.4     24.9            .7
 CLASS BIVALVIA
  ORDER HETERODONTA
```

```
    FAMILY SPHAERIIDAE
       PISIDIUM                                        43.1       .0       .0    14.4    24.9         .7
PHYLUM ARTHROPODA
 CLASS INSECTA
  ORDER DIPTERA
    FAMILY CHIRONOMIDAE
     SUBFAMILY ORTHOCLADIINAE
      TRIBES ORTHOCLADIINI AND METRIOCNEMIINI          43.1       .0    172.2    71.8    89.6        3.4

  TOTAL                                              1722.3   2798.7   1722.3  2081.1   621.5      100.0

DIVERSITY INDEX CALCULATIONS
----------------------------

SHANNON INDEX -  .232
VARIANCE      -  .0003
MAXIMUM INDEX - 1.386
EVENNESS      -  .167
NO OF TAXA    -     4

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TABLE 2.5.2-4

SHANNON-WEINER DIVERSITY (H'), EVENNESS (E), AND TOTAL NUMBER OF TAXA (N) IN BENTHIC MACROINVERTEBRATE SAMPLES COLLECTED FROM PICEANCE CREEK, MAY THROUGH NOVEMBER 1982, TRACT C-b

	Stewart Station			Middle Station			Hunter Station		
Sample Date	H'	E	N	H'	E	N	H'	E	N
June 1	1.08	0.45	11	0.44	0.17	13	0.22	0.14	5
June 30	0.64	0.31	8	0.03	0.02	5	0.16	0.11	4
July 29	0.53	0.27	7	0.63	0.30	8	1/		
September 2	0.26	0.24	3	0.95	0.59	5	0.12	0.08	4
October 4	1.13	0.47	11	1.38	0.56	12	0.06	0.04	5
November 3	1.12	0.49	10	1.24	0.60	8	0.23	0.17	4

1/ No samples collected due to a flash flood.

Mean densities ranged from 358.8 organisms/m^2 at Middle Station in September to 25,504.1 organisms/m^2 at Middle Station in July (Table 2.5.2-5). No consistent patterns involving density were apparent.

The order Haplotaxida was the dominant group of organisms in 1982 as measured by average percent relative abundance (Table 2.5.2-6). Haplotaxida comprised 97% of the organisms collected at Hunter station, 80% at Stewart Station, and 78% at Middle Station. Diptera was the second most abundant order at all stations and exhibited average relative abundances of 17% at Middle Station, 134% at Stewart Station, and 2% at Hunter Station. All other taxonomic groups collected in 1982 were represented by relatively low numbers.

Three taxa were collected in 1982 that did not appear in 1981 (Table 2.5.2-7). Twenty taxa that were present in 1981 were not encountered in 1982.

The results of the LSD test for evaluating differences between 1981 and 1982 benthic macroinvertebrate density calculated at each sample location during each sample period are provided in Table 2.5.2-8. The comparison of density data between stations for 1982 is provided in Table 2.5.2-9. In a comparison of 1981 with 1982 data, no differences are noted for July and September samples at Stewart Station; June, July, August and October samples at Middle Station; and August and September samples at Hunter Station. The May densities for both years were not significantly different at any station while July and August samples showed the greater disparity in densities for all stations. In a comparison of station density data from each station during 1982, densities were most similar for stations in close proximity (Stewart and Middle, Middle and Hunter) and most different for the two stations farthest apart on Piceance Creek: Stewart and Hunter. A comparison of Stewart plus Middle Station densities with Hunter Station diversities revealed a significant difference at the 10% level for August and September samples. Samples from other months showed no significant difference.

In order to evaluate whether Tract C-b development may have been responsible for the observed differences between 1981 and 1982 data and the differences between some sampling stations, the results of this investigation were compared to previous benthic macroinvertebrate studies of the Piceance Creek. The 1974-1976 C-b baseline study (C-b Annual Report 1977), as well as the study by Gray and Ward (1978), provide site-specific pre-development data which may be compared to current results. While these data are not in a form allowing statistical comparison to the 1981 and 1982 data, comparisons of general trends in taxonomic composition and density are possible. Strict comparisons of diversity indices from previous years is not possible due to differences in taxonomic levels of identification used.

TABLE 2.5.2-5

MEAN DENSITIES ($\#/m^2$) OF BENTHIC MACROINVERTEBRATE SAMPLES COLLECTED FROM PICEANCE CREEK, MAY THROUGH NOVEMBER 1982, TRACT C-b

Sample Date	Stewart Station	Middle Station	Hunter Station
June 1	3,085.8	7,563.7	4,205.2
June 30	2,353.8	18,442.8	9,512.0
July 29	11,180.5	25,504.1	1/
September 2	732.0	358.8	9,214.2
October 4	1,320.4	932.9	10,606.4
November 3	3,932.5	1,306.1	2,081.1

1/ No samples collected due to a flash flood.

TABLE 2.5.2-6

AVERAGE PERCENT RELATIVE ABUNDANCE OF BENTHIC FAUNA IN PICEANCE CREEK,
TRACT C-b, 1982
(values rounded to the nearest percent)[1]

Taxon	Stewart Station	Middle Station	Hunter Station [2]
Phylum Nematoda	3	1	+
Order Haplotaxida	80	78	97
Order Rhynchobdellida	+	1	+
Order Acarina	+	+	-
Order Ephemeroptera	3	1	+
Order Trichoptera	+	-	-
Order Coleoptera	+	1	+
Order Diptera	13	17	2
Order Bassomatophora	1	3	+
Order Heterodonta	+	-	+

[1] + = Present at less than 1%
- = Absent

[2] Based on five sampling periods; no samples collected in July

TABLE 2.5.2-7

BENTHIC MACROINVERTEBRATE TAXA ENCOUNTERED IN 1982 SAMPLES AT TRACT C-b BUT NOT IN 1981; AND THOSE ENCOUNTERED IN 1981 BUT ABSENT FROM THE 1982 LIST

Taxa Present in 1982 but not in 1981

Helobdella stagnalis

Zaitzevia parvula

Agabinus

Taxa Absent in 1982 but Present in 1981

Hyalella azteca

Gammarus lacustris

Ephemerella (*Serratella*)

Choroterpes

Isoperla

Hydroptila

Hesperophylax

Glossosoma

Helichus

Heliophorus

Agabus

Oreodytes and *Deronectes*

Diamesini

Prodiamesini

Corynoneurini

Dolichopodidae

Simulium

Muscidae

Dicranota

Euparyphus

TABLE 2.5.2-8

COMPARISON OF 1981 AND 1982 BENTHIC MACROINVERTEBRATE DENSITIES AT EACH SAMPLING STATION DURING EACH SAMPLING PERIOD USING FISHER'S LSD PROCEDURE (1949)[1/]

Month	Stewart	Middle	Hunter
May	-	-	-
June	-	5%	-
July	1%	1%	No data - 1982
August	-	1%	2%
September	10%	-	5%
October	-	10%	-

[1/] - = No significant difference
10% = Difference significant at the 10% level
5% = Difference significant at the 5% level
2% = Difference significant at the 2% level
1% = Difference significant at the 1% level

TABLE 2.5.2-9

COMPARISON OF BENTHIC MACROINVERTEBRATE DENSITIES BETWEEN EACH SAMPLING STATION DURING 1982 USING FISHER'S LSD PROCEDURE (1949)[1/]

Comparison	May	June	July	August	September	October
Stewart-Middle	-	2%	10%	-	-	1%
Stewart-Hunter	-	5%	[2/]	5%	2%	5%
Middle-Hunter	-	-	[2/]	-	10%	-
Stewart and Middle-Hunter	-	-	[2/]	10%	10%	-

[1/] - = No significant difference
10% = Difference significant at the 10% level
5% = Difference significant at the 5% level
2% = Difference significant at the 2% level
1% = Difference significant at the 1% level

[2/] No data for Hunter Station

Twenty-five taxa were collected in 1982 from Stewart Station in contrast with the 38 taxa found in 1981. Haplotaxida (primarily Tubificidae) was the dominant benthic group at this station during all 1982 sampling periods except November and comprised approximately 72%, 87%, 98%, 96%, 79%, and 48% of the total mean macroinvertebrate densities for the six sampling periods, respectively. Diptera (primarily chironomids) was the most abundant group collected in November at Stewart Station with 49% relative abundance. These results are very different from the 1981 monitoring study when Haplotaxida was dominant only in August and co-dominant in June. Also in 1981 at Stewart Station, Diptera was the most abundant order in May, September, and November and co-dominant in June; Dipterans comprised 50% of all macroinvertebrates collected in 1981. Ephemeroptera was dominant in July 1981 and had an overall average relative abundance of 10%. In contrast, Ephemeroptera was near abundant in 1982 and accounted for only 3% of the total macroinvertebrates collected at Stewart Station.

In 1980 at Stewart Station, Ephemeroptera was the dominant order in May, June, and September, Diptera dominated in July, and Trichoptera was the major taxon in November. During the 1974 through 1976 baseline study in the vicinity of Stewart Station, Ephemeroptera comprised 20% of the fauna, Diptera 32% and Haplotaxida 43%. From August 1975 to July 1976, Gray and Ward (1978) found Ephemeroptera to be 36% of the fauna at a Piceance Creek site just upstream from Stewart Station. Diptera and Haplotaxida comprised 16% and 34% of the fauna, respectively. From August 1976 to April 1977, Ephemeroptera accounted for 30% of the fauna, Diptera 12% and Haplotaxida 40% (Gray and Ward 1978).

Twenty-four taxa were collected from Middle Station in 1982 as compared to 31 in 1981. The findings at this station were very similar to those found at Stewart Station. Haplotaxida was again the dominant group during all sampling periods except November when Diptera was most abundant. These two orders comprised 95% of all macroinvertebrates collected at Middle Station in 1982. Average relative abundances of the major groups were fairly similar to those found in 1981. In 1982, average relative abundances of Haplotaxida, Diptera, and Ephemeroptera were 78%, 17%, and 1%, respectively, as compared to 1981 values of 70%, 23%, and 2%. In 1980, values were 36%, 44%, and 6% for Haplotaxida, Diptera, and Ephemeroptera, respectively. Macroinvertebrates were not sampled at Middle Station prior to 1980.

Only 11 taxa were recorded from Hunter Station in 1982, while 27 taxa were reported in 1981. The reduced species diversity at the station probably resulted from a flash flood that destroyed the July sample and deposited 2-4 feet of silt; this silt remained at the station through the remainder of the 1982 sampling period. Haplotaxida, a group of organisms that thrive on a silt substrate, was the most abundant group of organisms collected (97%) and was dominant during all sampling dates. Dipterans comprised 2% of the total densities at this station and all other groups collected were present at less than 1%. In 1981, the May and September samples at Hunter Station were dominated by Diptera while Haplotaxida was the most abundant group on all other sampling dates. While the dominant groups at this station have not changed between 1981 and 1982, the average relative abundance of each group has changed. In 1981, relative abundance indices were 55%, 32%, and 10% for Haplotaxida, Diptera, and Ephemeroptera, respectively, while in 1980, these values were 58%, 29%, and 12%, respectively.

During baseline studies (1974 through 1976), Haplotaxida comprised 47%, Ephemeroptera 20%, and Diptera 29% of the fauna at Hunter Station. Gray and Ward (1978), at a sampling site near Hunter Station, noted that Haplotaxida accounted for 34% of the fauna between August 1975 and July 1976, and 59% between August 1976 and April 1977. Similarly, the Ephemeroptera were 46% and 10%, while the Diptera were 18% and 27%, respectively.

In comparing the benthic macroinvertebrate data to data collected in 1980 and 1981, it is apparent that changes have occurred. While the three orders Haplotaxida, Diptera and Ephemeroptera have been consistently dominant in each year, the average relative abundance of each group has changed. Haplotaxida has increased in dominance each year and Ephemeroptera and Diptera have declined. Members of the order Plecoptera were absent in 1982 and the orders Coleoptera and Trichoptera generally declined to comprise less than 1% average relative abundance of the benthic fauna at each station.

Comparisons with previous studies must be made with caution because factors such as station location, time of sampling, length of sampling season, and taxonomic level of identification have not been constant from year to year. However, Gray and Ward (1978) reported that density, diversity and biomass tended to decrease from upstream to downstream in Piceance Creek. They also attributed the differences between stations to the influence of agriculture (irrigation withdrawals), springfed tributaries and ground water inflows. This observation is supported by data from 1980-1982. Moreover, siltation tends to be increasing at all stations (a flash flood at Hunter Station in late July changed the substrate composition from 40 to 90% silt) and accounts for the increases in relative abundance of Haplotaxida at all stations.

2.5.2.4 Periphyton

2.5.2.4.1 Methods of Periphyton Sampling & Analyses

The 1982 periphyton sampling stations located in Piceance Creek are identified as WP01 (Stewart Gulch near USGS Station WU07), WP02 (Middle Station) and WP03 (Hunter Creek near USGS Station WU61). Station WP01 was moved in 1977 from a baseline location of P-1 farther upstream to its current position as a control station above development impact.

Periphyton are collected from artificial substrates (glass slides) at each station during every sampling period. The glass slides are incubated in the water for at least 21 days. Nine slides are collected from each station, placed in individual cytomailers and preserved with 4% formalin. Three of the nine slides are used for taxonomic identification and enumeration, three for biomass determinations and three are extra slides in case any of the others become damaged.

The cytomailers are sent to Mariah Associates' Aquatics Laboratory in Laramie, Wyoming. All field procedures are executed by CB personnel.

Six collections were obtained during the period of June through October 1982. No periphyton sample is available from Station WP03, Hunter Creek, for July due to the July 29 flash flood.

Upon arrival, the biomass is removed from the slides with a razor blade, and the scrapings placed in separate crucibles to be dehydrated in a drying oven at 105 to 110°C. Samples are then cooled to room temperature in a dessicator and weighed to the nearest 0.0001 g (gross dry weight). After ashing in a muffle furnace at 450°C for approximately four hours, the samples are rewet upon cooling to replace their water of hydration, redried to a constant weight at 105 to 110°C and weighed to the nearest 0.0001 g (gross ash weight). Ash-free dry weight is obtained by subtracting gross ash weight from gross dry weight since the evaporating dish tare is assumed to be identical for the two weights.

Ash-free dry weight biomass is calculated according to the following equation:

$$\text{biomass (mg/cm}^2\text{)} = \frac{Wd - Wa}{As}$$

where: Wd = dry weight plus tare, mg
Wa = ash weight plus tare, mg
As = area scraped from slide, cm^2

Algae other than diatoms are identified directly from the slides with 200x or 400x magnification. The periphyton are then scraped from each slide with a razor blade and placed into separate jars. The contents of each jar are identified according to species composition and relative abundance.

2.5.2.4.2 Results

Periphyton data are presented in Tables 2.5.2-10 through -14 as species lists, density and diversity.

The diatoms (Bacillariophyta), represented by 131 taxa, were the major component of the algal collections. The green algae (Chlorophyta) were represented by 10 taxa, blue-green algae (Cyanophyta) represented by 7 taxa, and euglenoids (Euglenophyta) represented by 4 taxa.

During 1982, the diatoms were also the most abundant periphyton in all samples and accounted for 76 to 100% of the total mean periphyton density. The diatoms that dominated the periphyton of Piceance Creek in 1982 have similar known ecological requirements and tolerance. They attain best development in alkaline waters and are common in oligotrophic to mesotrophic (slightly to moderately organically enriched) rivers and streams of this region (Lowe 1974; Patrick and Reimer 1966).

PERIPHYTON DATA

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Table 2.5.2-10 Periphyton Species List III-96

Table 2.5.2-11 Periphyton Bench Sheets III-108

June 1, 1982 III-108
- Station 1
- Station 2
- Station 3

June 30, 1982 III-117
- Station 1
- Station 2
- Station 3

July 29, 1982 III-126
- Station 1
- Station 2

September 2, 1982 III-133
- Station 1
- Station 2
- Station 3

October 4, 1982 III-142
- Station 1
- Station 2
- Station 3

November 3, 1982 III-151
- Station 1
- Station 2
- Station 3

Table 2.5.2-12 PERIPHYTON BIOMASS BENCH SHEETS III-160

June 1, 1982 III-160
June 30, 1982 III-161
July 29, 1982 III-162
September 2, 1982 III-163
October 4, 1982 III-164
November 3, 1982 III-165

Table 2.5.2-13 PERIPHYTON BIOMASS ANALYSIS III-166

June 1, 1982 III-166
June 30, 1982 III-167
July 29, 1982 III-168
September 2, 1982 III-169
October 4, 1982 III-170
November 3, 1982 III-171

PERIPHYTON DATA

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Table 2.5.2-14 PERIPHYTON DENSITY AND SPECIES DIVERSITY ESTIMATES III-172

June 1, 1982 III-172
  Station 1
  Station 2
  Station 3

June 30, 1982 III-177
  Station 1
  Station 2
  Station 3

July 29, 1982 III-182
  Station 1
  Station 2

September 2, 1982 III-186
  Station 1
  Station 2
  Station 3

October 4, 1982 III-191
  Station 1
  Station 2
  Station 3

November 3, 1982 III-195
  Station 1
  Station 2
  Station 3

TABLE 2.5.2-10

PERIPHYTON SPECIES LIST

CATHEDRAL BLUFFS SHALE OIL COMPANY
PICEANCE CREEK
1982

TAXON	STATION NUMBER WP01	 WP02	 WP03
BACILLARIOPHYTA			
ACHNANTHES LANCEOLATA	X	X	X
ACHNANTHES LANCEOLATA VAR. DUBIA	X	X	X
ACHNANTHES LINEARIS	X	X	X
ACHNANTHES MINUTISSIMA	X	X	X
AMPHORA OVALIS	X	X	X
AMPHORA OVALIS VAR. AFFINIS	X	X	X
AMPHORA OVALIS VAR. PEDICULUS			X
AMPHORA PERPUSILLA	X	X	X
AMPHORA VENETA	X	X	
CALONEIS AMPHISBAENA	X	X	X
CALONEIS SP.		X	
CALONEIS VENTRICOSA VAR. MINUTA	X		
COCCONEIS PEDICULUS	X	X	X
COCCONEIS PLACENTULA	X		
COCCONEIS PLACENTULA VAR. EUGLYPTA	X	X	X
COCCONEIS PLACENTULA VAR. LINEATA	X	X	X
CYCLOTELLA KUTZINGIANA		X	
CYCLOTELLA MENEGHINIANA	X	X	X
CYMATOPLEURA SOLEA	X		X
CYMBELLA AFFINIS	X	X	X
CYMBELLA ASPERA	X		
CYMBELLA CYMBIFORMIS		X	X
CYMBELLA LAEVIS		X	
CYMBELLA MUELLERI	X		
CYMBELLA MICROCEPHALA		X	
CYMBELLA MINUTA	X		
CYMBELLA MINUTA VAR. SILESIACA	X	X	X
CYMBELLA SINUATA	X	X	X
DENTICULA ELEGANS	X		X
DENTICULA SP.		X	
DIATOMA TENUE		X	
DIATOMA TENUE VAR. ELONGATUM	X	X	X
DIATOMA VULGARE	X	X	X
ENTOMONEIS ORNATA			X
EPITHEMIA SOREX	X		
FRAGILARIA CONSTRUENS		X	
FRAGILAREA CONSTRUENS VAR. BINODIS	X	X	X
FRAGILARIA CONSTRUENS VAR. VENTER	X	X	X
FRAGILARIA CROTONENSIS	X		
FRAGILARIA LEPTOSTAURON	X	X	X
FRAGILARIA VAUCHERIAE	X	X	X
FRUSTULIA RHOMBOIDES		X	X
GOMPHONEMA ANGUSTATUM		X	X
GOMPHONEMA GRACILE	X		
GOMPHONEMA INTRICATUM			X
GOMPHONEMA OLIVACEUM	X	X	X
GOMPHONEMA PARVULUM	X	X	X
GOMPHONEMA SUBCLAVATUM	X	X	X
GOMPHONEMA TENELLUM	X	X	X
GOMPHONEMA SP.	X	X	X

GYROSIGMA SPENCERII	X	X	X
HANTZSCHIA AMPHIOXYS	X	X	X
MASTOGLOIA SPP.			X
MERIDION CIRCULARE	X	X	
MERIDION CIRCULARE VAR. CONSTRICTUM		X	
NAVICULA ARVENSIS	X	X	X
NAVICULA CINCTA		X	
NAVICULA CRYPTOCEPHALA	X	X	
NAVICULA CRYPTOCEPHALA VAR. VENETA	X	X	X
NAVICULA CUSPIDATA		X	X
NAVICULA HEUFLERI	X	X	X
NAVICULA LANCEOLATA VAR. DUBIA			X
NAVICULA LUZONENSIS			X
NAVICULA MINIMA	X	X	X
NAVICULA MINUSCULA	X		
NAVICULA MUTICA	X	X	X
NAVICULA MUTICA VAR. UNDULATA	X	X	X
NAVICULA NOTHA	X	X	X
NAVICULA PELLICULOSA	X		
NAVICULA PUPULA		X	X
NAVICULA PUPULA VAR. CAPITATA		X	X
NAVICULA PUPULA VAR. RECTANGULARIS	X		
NAVICULA PROTRACTA			X
NAVICULA PYGMAEA			X
NAVICULA RADIOSA		X	
NAVICULA RHYNCHOCEPHALA	X	X	
NAVICULA SALINARUM VAR. INTERMEDIA	X	X	X
NAVICULA SECRETA VAR. APICULATA	X	X	X
NAVICULA TRIPUNCTATA	X	X	
NAVICULA TRIPUNCTATA VAR. SCHIZONEMOIDES	X	X	X
NAVICULA VIRIDULA		X	
NAVICULA VIRIDULA VAR. AVENACEA	X	X	X
NAVICULA SP.	X	X	X
NITZSCHIA ACICULARIS	X	X	X
NITZSCHIA AMPHIBIA	X	X	
NITZSCHIA APICULATA	X	X	X
NITZSCHIA CAPITELLATA	X	X	
NITZSCHIA COMMUNIS	X	X	
NITZSCHIA DENTICULA	X		
NITZSCHIA DISSIPATA	X	X	X
NITZSCHIA FONTICOLA	X	X	X
NITZSCHIA FRUSTULUM	X	X	X
NITZSCHIA GRACILIS		X	
NITZSCHIA HUNGARICA	X	X	X
NITZSCHIA IGNORATA	X	X	
NITZSCHIA KUTZINGIANA	X		
NITZSCHIA LINEARIS	X	X	X
NITZSCHIA PALEACEA	X	X	X
NITZSCHIA PALEA	X	X	X
NITZSCHIA RECTA		X	
NITZSCHIA SIGMOIDEA	X	X	X
NITZSCHIA TRYBLIONELLA VAR. LEVIDENSIS	X	X	X
NITZSCHIA SP.	X	X	X
PINNULARIA BREBISSONII		X	X
PINNULARIA MICROSTAURON		X	
PINNULARIA VIRIDIS VAR. MINOR			X
PINNULARIA SP.			X
RHOICOSPHENIA CURVATA	X	X	X
RHOPALODIA GIBBA VAR. VENTRICOSA		X	X
RHOPALODIA MUSCULUS	X	X	X
SKELETONEMA POTAMOS	X		
STAURONEIS ANCEPS			X
STAURONEIS SMITHII		X	
STEPHANODISCUS SP.	X		X

STEPHANODISCUS TENUIS		X	
SURIRELLA ANGUSTATA		X	
SURIRELLA OVALIS	X	X	X
SURIRELLA OVATA	X	X	X
SYNEDRA ACUS	X	X	X
SYNEDRA AMPHICEPHALA	X	X	X
SYNEDRA DELICATISSIMA	X	X	X
SYNEDRA FASCICULATA	X	X	X
SYNEDRA FASCICULATA VAR. TRUNCATA	X	X	
SYNEDRA MINUSCULA	X	X	
SYNEDRA PULCHELLA	X	X	X
SYNEDRA RUMPENS VAR. FAMILIARIS		X	
SYNEDRA ULNA	X	X	X
SYNEDRA ULNA VAR. DANICA		X	
SYNEDRA SP.		X	
THALASSIOSIRA FLUVIATILIS	X	X	X
UNIDENTIFIED PENNATE DIATOMS	X	X	X
CHLOROPHYTA			
ANKISTRODESMUS SP.		X	
CHLAMYDOMONAS SP.	X	X	X
CLOSTERIUM SP.	X	X	
COELASTRUM SP.		X	
UNIDENTIFIED GREEN COCCOID		X	
MOUGEOTIA SP.	X	X	
OEDOGONIUM SP.	X		X
STIGEOCLONIUM TENUE	X	X	X
TETRAEDRON MINIMUM	X		
UNIDENTIFIED FILAMENT	X		X
CHRYSOPHYTA			
CYANOPHYTA			
ANABAENA SP.	X	X	X
CHROOCOCCUS SP.	X		X
LYNGBYA SP.	X	X	X
MERISMOPEDEA SP.		X	
OSCILLATORIA TENVIS	X	X	X
OSCILLATORIA SP.	X	X	X
PHORMIDIUM SP.	X	X	
EUGLENOPHYTA			
EUGLENA ACUS	X		
EUGLENA SP.		X	
PHACUS SP.	X	X	
TRACHELOMONAS SP.		X	
RHODOPHYTA			

X = ORGANISM IDENTIFIED TO THIS TAXONOMIC LEVEL OBSERVED AT SAMPLING STATION

PERIPHYTON SPECIES LIST

CATHEDRAL BLUFFS SHALE OIL COMPANY
PICEANCE CREEK

SPECIES OCCURRENCE BY SAMPLING DATE AT STATION WP01
1982

TAXON	MAY	JUNE	JULY	AUG	SEPT	OCT
BACILLARIOPHYTA						
ACHNANTHES LANCEOLATA						X
ACHNANTHES LANCEOLATA VAR. DUBIA	X	X	X	X	X	X
ACHNANTHES LINEARIS	X	X	X	X		X
ACHNANTHES MINUTISSIMA	X	X	X	X	X	X
AMPHORA OVALIS	X					
AMPHORA OVALIS VAR. AFFINIS						X
AMPHORA PERPUSILLA	X	X	X	X	X	X
AMPHORA VENETA						X
CALONEIS AMPHISBAENA		X	X			
CALONEIS VENTRICOSA VAR. MINUTA			X			
COCCONEIS PEDICULUS		X	X	X		X
COCCONEIS PLACENTULA			X			
COCCONEIS PLACENTULA VAR. EUGLYPTA	X		X	X		
COCCONEIS PLACENTULA VAR. LINEATA	X	X	X	X	X	X
CYCLOTELLA MENEGHINIANA	X	X	X	X	X	X
CYMATOPLEURA SOLEA			X			
CYMBELLA AFFINIS			X	X	X	X
CYMBELLA ASPERA				X		
CYMBELLA MUELLERI				X		
CYMBELLA MINUTA	X	X				
CYMBELLA MINUTA VAR. SILESIACA	X		X	X	X	X
CYMBELLA SINUATA	X		X	X	X	X
DENTICULA ELEGANS		X				
DIATOMA TENUE VAR. ELONGATUM						X
DIATOMA VULGARE	X	X	X	X	X	X
EPITHEMIA SOREX	X					
FRAGILARIA CONSTRUENS VAR. BINODIS	X		X			X
FRAGILARIA CONSTRUENS VAR. VENTER			X			
FRAGILARIA CROTONENSIS	X	X				
FRAGILARIA LEPTOSTAURON	X					
FRAGILARIA VAUCHERIAE	X	X	X	X	X	X
GOMPHONEMA GRACILE					X	
GOMPHONEMA OLIVACEUM	X	X	X	X	X	X
GOMPHONEMA PARVULUM	X	X	X	X	X	X
GOMPHONEMA SUBCLAVATUM			X			X
GOMPHONEMA TENELLUM	X			X	X	X
GOMPHONEMA SP.				X	X	
GYROSIGMA SPENCERII	X					
HANTZSCHIA AMPHIOXYS	X		X	X		X
MERIDION CIRCULARE	X					
NAVICULA ARVENSIS	X			X	X	
NAVICULA CRYPTOCEPHALA		X	X	X		
NAVICULA CRYPTOCEPHALA VAR. VENETA	X	X	X	X	X	X
NAVICULA HEUFLERI				X	X	X
NAVICULA MINIMA			X	X	X	X
NAVICULA MINUSCULA		X				
NAVICULA MUTICA		X		X	X	X
NAVICULA MUTICA VAR. UNDULATA	X					X

NAVICULA NOTHA	X		X		X	X
NAVICULA PELLICULOSA	X			X		
NAVICULA PUPULA VAR. RECTANGULARIS	X					
NAVICULA RHYNCHOCEPHALA						X
NAVICULA SALINARUM VAR. INTERMEDIA				X	X	X
NAVICULA SECRETA VAR. APICULATA	X	X	X	X	X	X
NAVICULA TRIPUNCTATA						X
NAVICULA TRIPUNCTATA VAR. SCHIZONEMOIDES	X		X	X	X	X
NAVICULA VIRIDULA VAR. AVENACEA	X	X	X	X	X	X
NAVICULA SP.			X			
NITZSCHIA ACICULARIS	X	X				
NITZSCHIA AMPHIBIA	X	X		X		
NITZSCHIA APICULATA	X	X	X	X		X
NITZSCHIA CAPITELLATA		X	X			X
NITZSCHIA COMMUNIS		X	X			X
NITZSCHIA DENTICULA				X		
NITZSCHIA DISSIPATA	X	X	X	X	X	X
NITZSCHIA FONTICOLA	X	X	X	X		
NITZSCHIA FRUSTULUM	X	X	X	X	X	X
NITZSCHIA HUNGARICA			X	X		
NITZSCHIA IGNORATA	X			X		
NITZSCHIA KUTZINGIANA	X					
NITZSCHIA LINEARIS		X	X		X	X
NITZSCHIA PALEACEA		X	X			X
NITZSCHIA PALEA	X	X	X	X	X	X
NITZSCHIA SIGMOIDEA	X		X	X		X
NITZSCHIA TRYBLIONELLA VAR. LEVIDENSIS			X			
NITZSCHIA SP.	X	X	X	X		
RHOICOSPHENIA CURVATA	X	X	X	X	X	X
RHOPALODIA MUSCULUS		X	X			
SKELETONEMA POTAMOS	X					
STEPHANODISCUS SP.			X			
SURIRELLA OVALIS	X			X		
SURIRELLA OVATA	X	X	X	X	X	X
SYNEDRA ACUS		X	X	X		X
SYNEDRA AMPHICEPHALA	X	X	X			
SYNEDRA DELICATISSIMA			X		X	X
SYNEDRA FASCICULATA				X		
SYNEDRA FASCICULATA VAR. TRUNCATA				X		
SYNEDRA MINUSCULA				X		
SYNEDRA PULCHELLA				X		
SYNEDRA ULNA	X	X	X	X	X	
THALASSIOSIRA FLUVIATILIS		X	X			
UNIDENTIFIED PENNATE DIATOMS	X	X	X	X		
CHLOROPHYTA						
CHLAMYDOMONAS SP.			X			
CLOSTERIUM SP.		X				
MOUGEOTIA SP.			X	X		
OEDOGONIUM SP.			X			
STIGEOCLONIUM TENUE		X	X	X	X	
TETRAEDRON MINIMUM			X			
UNIDENTIFIED FILAMENT	X			X		
CHRYSOPHYTA						
CYANOPHYTA						
ANABAENA SP.		X	X	X		X
CHROOCOCCUS SP.				X		
LYNGBYA SP.			X	X		X
OSCILLATORIA TENVIS		X	X		X	

OSCILLATORIA SP.		X	
PHORMIDIUM SP.	X	X	X
EUGLENOPHYTA			
EUGLENA ACUS	X		
PHACUS SP.		X	
RHODOPHYTA			

X = ORGANISM IDENTIFIED TO THIS TAXONOMIC LEVEL OBSERVED AT SAMPLING STATION

CATHEDRAL BLUFFS SHALE OIL COMPANY
PICEANCE CREEK

SPECIES OCCURRENCE BY SAMPLING DATE AT STATION WPO2
1982

TAXON	SAMPLING DATE MAY	JUNE	JULY	AUG	SEPT	OCT
BACILLARIOPHYTA						
ACHNANTHES LANCEOLATA	X		X		X	
ACHNANTHES LANCEOLATA VAR. DUBIA	X	X	X	X	X	X
ACHNANTHES LINEARIS	X	X	X	X	X	
ACHNANTHES MINUTISSIMA	X	X	X	X	X	X
AMPHORA OVALIS	X			X	X	
AMPHORA OVALIS VAR. AFFINIS				X		
AMPHORA PERPUSILLA	X	X	X	X	X	X
AMPHORA VENETA			X			
CALONEIS AMPHISBAENA	X	X				
CALONEIS SP.		X	X			
COCCONEIS PEDICULUS	X	X		X	X	X
COCCONEIS PLACENTULA VAR. EUGLYPTA				X		X
COCCONEIS PLACENTULA VAR. LINEATA	X	X	X	X	X	X
CYCLOTELLA KUTZINGIANA	X					
CYCLOTELLA MENEGHINIANA	X	X	X	X	X	X
CYMBELLA AFFINIS	X	X		X	X	X
CYMBELLA CYMBIFORMIS				X	X	
CYMBELLA LAEVIS		X				
CYMBELLA MICROCEPHALA	X					
CYMBELLA MINUTA VAR. SILESIACA	X	X	X	X	X	X
CYMBELLA SINUATA			X	X	X	X
DENTICULA SP.		X				
DIATOMA TENUE		X				
DIATOMA TENUE VAR. ELONGATUM	X	X		X		
DIATOMA VULGARE	X	X	X	X	X	X
FRAGILARIA CONSTRUENS						X
FRAGILAREA CONSTRUENS VAR. BINODIS	X	X	X		X	
FRAGILARIA CONSTRUENS VAR. VENTER		X			X	
FRAGILARIA LEPTOSTAURON	X	X		X	X	X
FRAGILARIA VAUCHERIAE	X	X	X	X	X	X
FRUSTULIA RHOMBOIDES					X	
GOMPHONEMA ANGUSTATUM	X					
GOMPHONEMA OLIVACEUM	X	X	X	X	X	X
GOMPHONEMA PARVULUM	X	X	X	X	X	X
GOMPHONEMA SUBCLAVATUM			X	X		X
GOMPHONEMA TENELLUM	X				X	X
GOMPHONEMA SP.	X			X		
GYROSIGMA SPENCERII		X		X	X	
HANTZSCHIA AMPHIOXYS	X		X	X	X	X
MERIDION CIRCULARE	X					
MERIDION CIRCULARE VAR. CONSTRICTUM		X				
NAVICULA ARVENSIS	X			X	X	X
NAVICULA CINCTA	X					
NAVICULA CRYPTOCEPHALA		X	X	X		
NAVICULA CRYPTOCEPHALA VAR. VENETA	X	X	X	X	X	X
NAVICULA CUSPIDATA			X	X		
NAVICULA HEUFLERI				X	X	X
NAVICULA MINIMA			X	X	X	X

NAVICULA MUTICA	X			X	X	
NAVICULA MUTICA VAR. UNDULATA		X		X	X	
NAVICULA NOTHA	X		X	X	X	X
NAVICULA PUPULA				X	X	
NAVICULA PUPULA VAR. CAPITATA		X				
NAVICULA RADIOSA	X					
NAVICULA RHYNCHOCEPHALA	X	X		X		
NAVICULA SALINARUM VAR. INTERMEDIA				X	X	X
NAVICULA SECRETA VAR. APICULATA	X	X	X	X	X	X
NAVICULA TRIPUNCTATA						X
NAVICULA TRIPUNCTATA VAR. SCHIZONEMOIDES	X	X	X	X	X	X
NAVICULA VIRIDULA			X			
NAVICULA VIRIDULA VAR. AVENACEA	X	X	X	X	X	X
NAVICULA SP.				X		
NITZSCHIA ACICULARIS	X				X	
NITZSCHIA AMPHIBIA				X	X	
NITZSCHIA APICULATA		X	X	X	X	X
NITZSCHIA CAPITELLATA	X	X	X			X
NITZSCHIA COMMUNIS	X		X			
NITZSCHIA DISSIPATA	X	X	X	X	X	X
NITZSCHIA FONTICOLA	X	X	X	X	X	
NITZSCHIA FRUSTULUM	X	X	X	X	X	X
NITZSCHIA GRACILIS		X				X
NITZSCHIA HUNGARICA		X				
NITZSCHIA IGNORATA						X
NITZSCHIA LINEARIS	X	X	X		X	X
NITZSCHIA PALEACEA		X	X			
NITZSCHIA PALEA	X	X	X	X	X	X
NITZSCHIA RECTA	X					
NITZSCHIA SIGMOIDEA		X	X		X	
NITZSCHIA TRYBLIONELLA VAR. LEVIDENSIS		X	X	X		X
NITZSCHIA SP.	X	X	X	X	X	X
PINNULARIA BREBISSONII	X			X	X	
PINNULARIA MICROSTAURON		X				
RHOICOSPHENIA CURVATA	X	X	X	X	X	X
RHOPALODIA GIBBA VAR. VENTRICOSA	X	X				
RHOPALODIA MUSCULUS		X	X			
STAURONEIS SMITHII					X	
STEPHANODISCUS TENUIS	X					
SURIRELLA ANGUSTATA					X	
SURIRELLA OVALIS	X	X		X		
SURIRELLA OVATA	X	X	X	X	X	X
SYNEDRA ACUS		X				X
SYNEDRA AMPHICEPHALA	X	X				
SYNEDRA DELICATISSIMA	X		X	X		X
SYNEDRA FASCICULATA				X	X	
SYNEDRA FASCICULATA VAR. TRUNCATA			X			
SYNEDRA MINUSCULA				X		
SYNEDRA PULCHELLA				X		
SYNEDRA RUMPENS VAR. FAMILIARIS				X		
SYNEDRA ULNA	X	X	X	X	X	X
SYNEDRA ULNA VAR. DANICA		X				
SYNEDRA SP.				X	X	
THALASSIOSIRA FLUVIATILIS		X	X	X		X
UNIDENTIFIED PENNATE DIATOMS	X	X	X	X	X	X
CHLOROPHYTA						
ANKISTRODESMUS SP.			X			
CHLAMYDOMONAS SP.		X	X			
CLOSTERIUM SP.				X		
COELASTRUM SP.		X				
UNIDENTIFIED GREEN COCCOID	X	X				
MOUGEOTIA SP.			X			

STIGEOCLONIUM TENUE		X	X	X		
CHRYSOPHYTA						
CYANOPHYTA						
ANABAENA SP.	X		X	X		
LYNGBYA SP.				X	X	X
MERISMOPEDEA SP.				X		
OSCILLATORIA TENVIS		X		X		
OSCILLATORIA SP.		X	X		X	
PHORMIDIUM SP.		X	X			
EUGLENOPHYTA						
EUGLENA SP.		X			X	
PHACUS SP.		X				
TRACHELOMONAS SP.			X			
RHODOPHYTA						

X = ORGANISM IDENTIFIED TO THIS TAXONOMIC LEVEL OBSERVED AT SAMPLING STATION

PERIPHYTON SPECIES LIST

CATHEDRAL BLUFFS SHALE OIL COMPANY
PICEANCE CREEK

SPECIES OCCURRENCE BY SAMPLING DATE AT STATION WP03
1982

TAXON	SAMPLING DATE					
	MAY	JUNE	JULY	AUG	SEPT	OCT
BACILLARIOPHYTA						
ACHNANTHES LANCEOLATA	X	X				X
ACHNANTHES LANCEOLATA VAR. DUBIA	X	X		X	X	X
ACHNANTHES LINEARIS	X	X				
ACHNANTHES MINUTISSIMA	X	X			X	X
AMPHORA OVALIS	X					
AMPHORA OVALIS VAR. AFFINIS					X	X
AMPHORA OVALIS VAR. PEDICULUS		X				
AMPHORA PERPUSILLA	X	X			X	X
CALONEIS AMPHISBAENA	X	X				
COCCONEIS PEDICULUS	X	X		X		
COCCONEIS PLACENTULA VAR. EUGLYPTA				X		
COCCONEIS PLACENTULA VAR. LINEATA	X	X		X	X	X
CYCLOTELLA MENEGHINIANA	X	X			X	X
CYMATOPLEURA SOLEA		X				
CYMBELLA AFFINIS	X	X		X	X	X
CYMBELLA CYMBIFORMIS						X
CYMBELLA MINUTA VAR. SILESIACA	X	X			X	X
CYMBELLA SINUATA	X					X
DENTICULA ELEGANS					X	
DIATOMA TENUE VAR. ELONGATUM				X		X
DIATOMA VULGARE	X	X		X	X	X
ENTOMONEIS ORNATA					X	
FRAGILAREA CONSTRUENS VAR. BINODIS					X	
FRAGILARIA CONSTRUENS VAR. VENTER	X					
FRAGILARIA LEPTOSTAURON		X			X	X
FRAGILARIA VAUCHERIAE	X	X		X	X	X
FRUSTULIA RHOMBOIDES					X	
GOMPHONEMA ANGUSTATUM		X				
GOMPHONEMA INTRICATUM				X		
GOMPHONEMA OLIVACEUM	X			X	X	X
GOMPHONEMA PARVULUM	X	X		X	X	X
GOMPHONEMA SUBCLAVATUM	X	X		X		X
GOMPHONEMA TENELLUM				X	X	X
GOMPHONEMA SP.		X			X	
GYROSIGMA SPENCERII		X				
HANTZSCHIA AMPHIOXYS	X	X			X	
MASTOGLOIA SPP.						X
NAVICULA ARVENSIS		X		X	X	
NAVICULA CRYPTOCEPHALA VAR. VENETA	X	X		X	X	X
NAVICULA CUSPIDATA		X				
NAVICULA HEUFLERI	X	X		X	X	X
NAVICULA LANCEOLATA VAR. DUBIA						X
NAVICULA LUZONENSIS		X				
NAVICULA MINIMA		X			X	X
NAVICULA MUTICA		X			X	X
NAVICULA MUTICA VAR. UNDULATA					X	
NAVICULA NOTHA	X				X	X
NAVICULA PUPULA		X			X	X

NAVICULA PUPULA VAR. CAPITATA				X	
NAVICULA PROTRACTA		X			
NAVICULA PYGMAEA	X				
NAVICULA SALINARUM VAR. INTERMEDIA				X	X
NAVICULA SECRETA VAR. APICULATA	X	X	X	X	X
NAVICULA TRIPUNCTATA VAR. SCHIZONEMOIDES	X			X	X
NAVICULA VIRIDULA VAR. AVENACEA	X	X	X	X	X
NAVICULA SP.					X
NITZSCHIA ACICULARIS	X				
NITZSCHIA APICULATA	X	X	X	X	X
NITZSCHIA DISSIPATA	X	X	X	X	X
NITZSCHIA FONTICOLA	X	X	X		
NITZSCHIA FRUSTULUM	X	X	X	X	X
NITZSCHIA HUNGARICA	X	X		X	X
NITZSCHIA LINEARIS	X	X			
NITZSCHIA PALEACEA		X			
NITZSCHIA PALEA	X	X			X
NITZSCHIA SIGMOIDEA		X			X
NITZSCHIA TRYBLIONELLA VAR. LEVIDENSIS		X	X		
NITZSCHIA SP.	X	X		X	
PINNULARIA BREBISSONII				X	X
PINNULARIA VIRIDIS VAR. MINOR		X			
PINNULARIA SP.		X			
RHOICOSPHENIA CURVATA	X	X	X	X	X
RHOPALODIA GIBBA VAR. VENTRICOSA		X			
RHOPALODIA MUSCULUS		X		X	X
STAURONEIS ANICEPS				X	
STEPHANODISCUS SP.				X	X
SURIRELLA OVALIS	X	X			
SURIRELLA OVATA	X	X	X	X	X
SYNEDRA ACUS				X	X
SYNEDRA AMPHICEPHALA	X				X
SYNEDRA DELICATISSIMA		X			
SYNEDRA FASCICULATA	X				
SYNEDRA PULCHELLA		X		X	
SYNEDRA ULNA	X	X		X	X
THALASSIOSIRA FLUVIATILIS	X	X		X	
UNIDENTIFIED PENNATE DIATOMS		X		X	X
CHLOROPHYTA					
CHLAMYDOMONAS SP.			X		
OEDOGONIUM SP.			X		
STIGEOCLONIUM TENUE		X	X	X	
UNIDENTIFIED FILAMENT	X				
CHRYSOPHYTA					
CYANOPHYTA					
ANABAENA SP.			X		X
CHROOCOCCUS SP.			X		
LYNGBYA SP.			X		
OSCILLATORIA TENVIS		X			
OSCILLATORIA SP.		X			
EUGLENOPHYTA					
RHODOPHYTA					

X = ORGANISM IDENTIFIED TO THIS TAXONOMIC LEVEL OBSERVED AT SAMPLING STATION

TABLE 2.5.2-11

PERIPHYTON BENCH SHEET

CATHEDRAL BLUFFS SHALE OIL COMPANY
PICEANCE CREEK

SAMPLE STATION: WP01 - STEWART
NUMBER OF REPLICATES - 3

REPLICATE - 1
SAMPLE DATE - 06-01-82

C - 592 V - 110 ML DF - 1:0 L - 50 MM W - .33 MM D - 1 MM S - .5 A - 3750 MM2
SUBSTRATE - GLASS SLIDES

LOG NUMBER - 158-PA1 . ANALYST - FHB

TAXON CODE	TAXON	NUMBER COUNTED DIATOMS PROPORTIONAL COUNT	NUMBER COUNTED NON-DIATOMS SEDGWICK-RAFTER COUNT
1SKPOT	SKELETONEMA POTAMOS	4	
1NAARV	NAVICULA ARVENSIS	1	
1NAVIA	NAVICULA VIRIDULA VAR. AVENACEA	108	
1COCPU	COCCONEIS PLACENTULA VAR. EUGLYPTA	2	
1ACMIN	ACHNANTHES MINUTISSIMA	30	
1CYMMS	CYMBELLA MINUTA VAR. SILESIACA	P	
1NIDIS	NITZSCHIA DISSIPATA	5	
1ACLAD	ACHNANTHES LANCEOLATA VAR. DUBIA	6	
1SUOVA	SURIRELLA OVATA	5	
1RHCUR	RHOICOSPHENIA CURVATA	9	
1CYCME	CYCLOTELLA MENEGHINIANA	P	
1NANOT	NAVICULA NOTHA	P	
1NIPAL	NITZSCHIA PALEA	4	
1NASEA	NAVICULA SECRETA VAR. APICULATA	6	
1COCPI	COCCONEIS PLACENTULA VAR. LINEATA	1	
1NACRV	NAVICULA CRYPTOCEPHALA VAR. VENETA	5	
1NIFRU	NITZSCHIA FRUSTULUM	1	
1UNPEN	UNIDENTIFIED PENNATE DIATOMS	2	
1NISPP	NITZSCHIA SP.	4	
1FRAVA	FRAGILARIA VAUCHERIAE	1	
1NIFON	NITZSCHIA FONTICOLA	1	
1FRACR	FRAGILARIA CROTONENSIS	2	
1CYMSI	CYMBELLA SINUATA	2	
1NIAPI	NITZSCHIA APICULATA	3	
1SYAMP	SYNEDRA AMPHICEPHALA	2	
1DIVUL	DIATOMA VULGARE	P	
1GYSPE	GYROSIGMA SPENCERII	P	
1MERCI	MERIDION CIRCULARE	P	
1SYULN	SYNEDRA ULNA	P	
1NATSC	NAVICULA TRIPUNCTATA VAR. SCHIZONEMOIDES	P	
1AMPER	AMPHORA PERPUSILLA	P	
1NISIE	NITZSCHIA SIGMOIDEA	P	
1FRACB	FRAGILAREA CONSTRUENS VAR. BINODIS	P	
1SUOVL	SURIRELLA OVALIS	P	
1NAMUU	NAVICULA MUTICA VAR. UNDULATA	P	
1EPSOR	EPITHEMIA SOREX	P	
1FRALE	FRAGILARIA LEPTOSTAURON	P	
1ACLIN	ACHNANTHES LINEARIS	P	

Six collections were obtained during the period of June through October 1982. No periphyton sample is available from Station WP03, Hunter Creek, for July due to the July 29 flash flood.

Upon arrival, the biomass is removed from the slides with a razor blade, and the scrapings placed in separate crucibles to be dehydrated in a drying oven at 105 to 110°C. Samples are then cooled to room temperature in a dessicator and weighed to the nearest 0.0001 g (gross dry weight). After ashing in a muffle furnace at 450°C for approximately four hours, the samples are rewet upon cooling to replace their water of hydration, redried to a constant weight at 105 to 110°C and weighed to the nearest 0.0001 g (gross ash weight). Ash-free dry weight is obtained by subtracting gross ash weight from gross dry weight since the evaporating dish tare is assumed to be identical for the two weights.

Ash-free dry weight biomass is calculated according to the following equation:

$$\text{biomass (mg/cm}^2\text{)} = \frac{Wd - Wa}{As}$$

where: Wd = dry weight plus tare, mg
Wa = ash weight plus tare, mg
As = area scraped from slide, cm^2

Algae other than diatoms are identified directly from the slides with 200x or 400x magnification. The periphyton are then scraped from each slide with a razor blade and placed into separate jars. The contents of each jar are identified according to species composition and relative abundance.

2.5.2.4.2 Results

Periphyton data are presented in Tables 2.5.2-10 through -14 as species lists, density and diversity.

The diatoms (Bacillariophyta), represented by 131 taxa, were the major component of the algal collections. The green algae (Chlorophyta) were represented by 10 taxa, blue-green algae (Cyanophyta) represented by 7 taxa, and euglenoids (Euglenophyta) represented by 4 taxa.

During 1982, the diatoms were also the most abundant periphyton in all samples and accounted for 76 to 100% of the total mean periphyton density. The diatoms that dominated the periphyton of Piceance Creek in 1982 have similar known ecological requirements and tolerance. They attain best development in alkaline waters and are common in oligotrophic to mesotrophic (slightly to moderately organically enriched) rivers and streams of this region (Lowe 1974; Patrick and Reimer 1966).

PERIPHYTON DATA

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PERIPHYTON DATA

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  - Station 3
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  - Station 3
- November 3, 1982 III-195
  - Station 1
  - Station 2
  - Station 3

TABLE 2.5.2-10

PERIPHYTON SPECIES LIST

CATHEDRAL BLUFFS SHALE OIL COMPANY
PICEANCE CREEK
1982

TAXON	STATION NUMBER		
	WP01	WP02	WP03
BACILLARIOPHYTA			
ACHNANTHES LANCEOLATA	X	X	X
ACHNANTHES LANCEOLATA VAR. DUBIA	X	X	X
ACHNANTHES LINEARIS	X	X	X
ACHNANTHES MINUTISSIMA	X	X	X
AMPHORA OVALIS	X	X	X
AMPHORA OVALIS VAR. AFFINIS	X	X	X
AMPHORA OVALIS VAR. PEDICULUS			X
AMPHORA PERPUSILLA	X	X	X
AMPHORA VENETA	X	X	
CALONEIS AMPHISBAENA	X	X	X
CALONEIS SP.		X	
CALONEIS VENTRICOSA VAR. MINUTA	X		
COCCONEIS PEDICULUS	X	X	X
COCCONEIS PLACENTULA	X		
COCCONEIS PLACENTULA VAR. EUGLYPTA	X	X	X
COCCONEIS PLACENTULA VAR. LINEATA	X	X	X
CYCLOTELLA KUTZINGIANA		X	
CYCLOTELLA MENEGHINIANA	X	X	X
CYMATOPLEURA SOLEA	X		X
CYMBELLA AFFINIS	X	X	X
CYMBELLA ASPERA	X		
CYMBELLA CYMBIFORMIS		X	X
CYMBELLA LAEVIS		X	
CYMBELLA MUELLERI	X		
CYMBELLA MICROCEPHALA		X	
CYMBELLA MINUTA	X		
CYMBELLA MINUTA VAR. SILESIACA	X	X	X
CYMBELLA SINUATA	X	X	X
DENTICULA ELEGANS	X		X
DENTICULA SP.		X	
DIATOMA TENUE		X	
DIATOMA TENUE VAR. ELONGATUM	X	X	X
DIATOMA VULGARE	X	X	X
ENTOMONEIS ORNATA			X
EPITHEMIA SOREX	X		
FRAGILARIA CONSTRUENS		X	
FRAGILAREA CONSTRUENS VAR. BINODIS	X	X	X
FRAGILARIA CONSTRUENS VAR. VENTER	X	X	X
FRAGILARIA CROTONENSIS	X		
FRAGILARIA LEPTOSTAURON	X	X	X
FRAGILARIA VAUCHERIAE	X	X	X
FRUSTULIA RHOMBOIDES		X	X
GOMPHONEMA ANGUSTATUM		X	X
GOMPHONEMA GRACILE	X		
GOMPHONEMA INTRICATUM			X
GOMPHONEMA OLIVACEUM	X	X	X
GOMPHONEMA PARVULUM	X	X	X
GOMPHONEMA SUBCLAVATUM	X	X	X
GOMPHONEMA TENELLUM	X	X	X
GOMPHONEMA SP.	X	X	X

GYROSIGMA SPENCERII	X	X	X
HANTZSCHIA AMPHIOXYS	X	X	X
MASTOGLOIA SPP.			X
MERIDION CIRCULARE	X	X	
MERIDION CIRCULARE VAR. CONSTRICTUM		X	
NAVICULA ARVENSIS	X	X	X
NAVICULA CINCTA		X	
NAVICULA CRYPTOCEPHALA	X	X	
NAVICULA CRYPTOCEPHALA VAR. VENETA	X	X	X
NAVICULA CUSPIDATA		X	X
NAVICULA HEUFLERI	X	X	X
NAVICULA LANCEOLATA VAR. DUBIA			X
NAVICULA LUZONENSIS			X
NAVICULA MINIMA	X	X	X
NAVICULA MINUSCULA	X		
NAVICULA MUTICA	X	X	X
NAVICULA MUTICA VAR. UNDULATA	X	X	X
NAVICULA NOTHA	X	X	X
NAVICULA PELLICULOSA	X		
NAVICULA PUPULA		X	X
NAVICULA PUPULA VAR. CAPITATA		X	X
NAVICULA PUPULA VAR. RECTANGULARIS	X		
NAVICULA PROTRACTA			X
NAVICULA PYGMAEA			X
NAVICULA RADIOSA		X	
NAVICULA RHYNCHOCEPHALA	X	X	
NAVICULA SALINARUM VAR. INTERMEDIA	X	X	X
NAVICULA SECRETA VAR. APICULATA	X	X	X
NAVICULA TRIPUNCTATA	X	X	
NAVICULA TRIPUNCTATA VAR. SCHIZONEMOIDES	X	X	X
NAVICULA VIRIDULA		X	
NAVICULA VIRIDULA VAR. AVENACEA	X	X	X
NAVICULA SP.	X	X	X
NITZSCHIA ACICULARIS	X	X	X
NITZSCHIA AMPHIBIA	X	X	
NITZSCHIA APICULATA	X	X	X
NITZSCHIA CAPITELLATA	X	X	
NITZSCHIA COMMUNIS	X	X	
NITZSCHIA DENTICULA	X		
NITZSCHIA DISSIPATA	X	X	X
NITZSCHIA FONTICOLA	X	X	X
NITZSCHIA FRUSTULUM	X	X	X
NITZSCHIA GRACILIS		X	
NITZSCHIA HUNGARICA	X	X	X
NITZSCHIA IGNORATA	X	X	
NITZSCHIA KUTZINGIANA	X		
NITZSCHIA LINEARIS	X	X	X
NITZSCHIA PALEACEA	X	X	X
NITZSCHIA PALEA	X	X	X
NITZSCHIA RECTA		X	
NITZSCHIA SIGMOIDEA	X	X	X
NITZSCHIA TRYBLIONELLA VAR. LEVIDENSIS	X	X	X
NITZSCHIA SP.	X	X	X
PINNULARIA BREBISSONII		X	X
PINNULARIA MICROSTAURON		X	
PINNULARIA VIRIDIS VAR. MINOR			X
PINNULARIA SP.			X
RHOICOSPHENIA CURVATA	X	X	X
RHOPALODIA GIBBA VAR. VENTRICOSA		X	X
RHOPALODIA MUSCULUS	X	X	X
SKELETONEMA POTAMOS	X		
STAURONEIS ANICEPS			X
STAURONEIS SMITHII		X	
STEPHANODISCUS SP.	X		X

STEPHANODISCUS TENUIS		X	
SURIRELLA ANGUSTATA		X	
SURIRELLA OVALIS	X	X	X
SURIRELLA OVATA	X	X	X
SYNEDRA ACUS	X	X	X
SYNEDRA AMPHICEPHALA	X	X	X
SYNEDRA DELICATISSIMA	X	X	X
SYNEDRA FASCICULATA	X	X	X
SYNEDRA FASCICULATA VAR. TRUNCATA	X	X	
SYNEDRA MINUSCULA	X	X	
SYNEDRA PULCHELLA	X	X	X
SYNEDRA RUMPENS VAR. FAMILIARIS		X	
SYNEDRA ULNA	X	X	X
SYNEDRA ULNA VAR. DANICA		X	
SYNEDRA SP.		X	
THALASSIOSIRA FLUVIATILIS	X	X	X
UNIDENTIFIED PENNATE DIATOMS	X	X	X
CHLOROPHYTA			
ANKISTRODESMUS SP.		X	
CHLAMYDOMONAS SP.	X	X	X
CLOSTERIUM SP.	X	X	
COELASTRUM SP.		X	
UNIDENTIFIED GREEN COCCOID		X	
MOUGEOTIA SP.	X	X	
OEDOGONIUM SP.	X		X
STIGEOCLONIUM TENUE	X	X	X
TETRAEDRON MINIMUM	X		
UNIDENTIFIED FILAMENT	X		X
CHRYSOPHYTA			
CYANOPHYTA			
ANABAENA SP.	X	X	X
CHROOCOCCUS SP.	X		X
LYNGBYA SP.	X	X	X
MERISMOPEDEA SP.		X	
OSCILLATORIA TENVIS	X	X	X
OSCILLATORIA SP.	X	X	X
PHORMIDIUM SP.	X	X	
EUGLENOPHYTA			
EUGLENA ACUS	X		
EUGLENA SP.		X	
PHACUS SP.	X	X	
TRACHELOMONAS SP.		X	
RHODOPHYTA			

X = ORGANISM IDENTIFIED TO THIS TAXONOMIC LEVEL OBSERVED AT SAMPLING STATION

PERIPHYTON SPECIES LIST

CATHEDRAL BLUFFS SHALE OIL COMPANY
PICEANCE CREEK

SPECIES OCCURRENCE BY SAMPLING DATE AT STATION WP01
1982

TAXON	SAMPLING DATE MAY	 JUNE	 JULY	 AUG	 SEPT	 OCT
BACILLARIOPHYTA						
ACHNANTHES LANCEOLATA						X
ACHNANTHES LANCEOLATA VAR. DUBIA	X	X	X	X	X	X
ACHNANTHES LINEARIS	X	X	X	X		X
ACHNANTHES MINUTISSIMA	X	X	X	X	X	X
AMPHORA OVALIS	X					
AMPHORA OVALIS VAR. AFFINIS						X
AMPHORA PERPUSILLA	X	X	X	X	X	X
AMPHORA VENETA						X
CALONEIS AMPHISBAENA		X	X			
CALONEIS VENTRICOSA VAR. MINUTA			X			
COCCONEIS PEDICULUS		X	X	X		X
COCCONEIS PLACENTULA			X			
COCCONEIS PLACENTULA VAR. EUGLYPTA	X		X	X		
COCCONEIS PLACENTULA VAR. LINEATA	X	X	X	X	X	X
CYCLOTELLA MENEGHINIANA	X	X	X	X	X	X
CYMATOPLEURA SOLEA			X			
CYMBELLA AFFINIS			X	X	X	X
CYMBELLA ASPERA				X		
CYMBELLA MUELLERI				X		
CYMBELLA MINUTA	X	X				
CYMBELLA MINUTA VAR. SILESIACA	X		X	X	X	X
CYMBELLA SINUATA	X		X	X	X	X
DENTICULA ELEGANS		X				
DIATOMA TENUE VAR. ELONGATUM						X
DIATOMA VULGARE	X	X	X	X	X	X
EPITHEMIA SOREX	X					
FRAGILARIA CONSTRUENS VAR. BINODIS	X		X			X
FRAGILARIA CONSTRUENS VAR. VENTER			X			
FRAGILARIA CROTONENSIS	X	X				
FRAGILARIA LEPTOSTAURON	X					
FRAGILARIA VAUCHERIAE	X	X	X	X	X	X
GOMPHONEMA GRACILE					X	
GOMPHONEMA OLIVACEUM	X	X	X	X	X	X
GOMPHONEMA PARVULUM	X	X	X	X	X	X
GOMPHONEMA SUBCLAVATUM			X			X
GOMPHONEMA TENELLUM	X			X	X	X
GOMPHONEMA SP.				X	X	
GYROSIGMA SPENCERII	X					
HANTZSCHIA AMPHIOXYS	X		X	X		X
MERIDION CIRCULARE	X					
NAVICULA ARVENSIS	X			X	X	
NAVICULA CRYPTOCEPHALA		X	X	X		
NAVICULA CRYPTOCEPHALA VAR. VENETA	X	X	X	X	X	X
NAVICULA HEUFLERI				X	X	X
NAVICULA MINIMA			X	X	X	X
NAVICULA MINUSCULA		X				
NAVICULA MUTICA		X		X	X	X
NAVICULA MUTICA VAR. UNDULATA	X					X

NAVICULA NOTHA	X		X		X	X
NAVICULA PELLICULOSA	X			X		
NAVICULA PUPULA VAR. RECTANGULARIS	X					
NAVICULA RHYNCHOCEPHALA						X
NAVICULA SALINARUM VAR. INTERMEDIA				X	X	X
NAVICULA SECRETA VAR. APICULATA	X	X	X	X	X	X
NAVICULA TRIPUNCTATA						X
NAVICULA TRIPUNCTATA VAR. SCHIZONEMOIDES	X		X	X	X	X
NAVICULA VIRIDULA VAR. AVENACEA	X	X	X	X	X	X
NAVICULA SP.			X			
NITZSCHIA ACICULARIS	X	X				
NITZSCHIA AMPHIBIA	X	X		X		
NITZSCHIA APICULATA	X	X	X	X		X
NITZSCHIA CAPITELLATA		X	X			X
NITZSCHIA COMMUNIS		X	X			X
NITZSCHIA DENTICULA				X		
NITZSCHIA DISSIPATA	X	X	X	X	X	X
NITZSCHIA FONTICOLA	X	X	X	X		
NITZSCHIA FRUSTULUM	X	X	X	X	X	X
NITZSCHIA HUNGARICA			X	X		
NITZSCHIA IGNORATA	X			X		
NITZSCHIA KUTZINGIANA	X					
NITZSCHIA LINEARIS		X	X		X	X
NITZSCHIA PALEACEA		X	X			X
NITZSCHIA PALEA	X	X	X	X	X	X
NITZSCHIA SIGMOIDEA	X		X	X		X
NITZSCHIA TRYBLIONELLA VAR. LEVIDENSIS			X			
NITZSCHIA SP.	X	X	X	X		
RHOICOSPHENIA CURVATA	X	X	X	X	X	X
RHOPALODIA MUSCULUS		X	X			
SKELETONEMA POTAMOS	X					
STEPHANODISCUS SP.			X			
SURIRELLA OVALIS	X			X		
SURIRELLA OVATA	X	X	X	X	X	X
SYNEDRA ACUS		X	X	X		X
SYNEDRA AMPHICEPHALA	X	X	X			
SYNEDRA DELICATISSIMA			X		X	X
SYNEDRA FASCICULATA				X		
SYNEDRA FASCICULATA VAR. TRUNCATA				X		
SYNEDRA MINUSCULA				X		
SYNEDRA PULCHELLA				X		
SYNEDRA ULNA	X	X	X	X	X	
THALASSIOSIRA FLUVIATILIS		X	X			
UNIDENTIFIED PENNATE DIATOMS	X	X	X	X		
CHLOROPHYTA						
CHLAMYDOMONAS SP.			X			
CLOSTERIUM SP.		X				
MOUGEOTIA SP.			X	X		
OEDOGONIUM SP.			X			
STIGEOCLONIUM TENUE		X	X	X	X	
TETRAEDRON MINIMUM			X			
UNIDENTIFIED FILAMENT	X			X		
CHRYSOPHYTA						
CYANOPHYTA						
ANABAENA SP.		X	X	X		X
CHROOCOCCUS SP.				X		
LYNGBYA SP.			X	X		X
OSCILLATORIA TENUIS		X	X		X	

OSCILLATORIA SP.		X	
PHORMIDIUM SP.	X	X	X
EUGLENOPHYTA			
EUGLENA ACUS	X		
PHACUS SP.		X	
RHODOPHYTA			

X = ORGANISM IDENTIFIED TO THIS TAXONOMIC LEVEL OBSERVED AT SAMPLING STATION

PERIPHYTON SPECIES LIST

CATHEDRAL BLUFFS SHALE OIL COMPANY
PICEANCE CREEK

SPECIES OCCURRENCE BY SAMPLING DATE AT STATION WPO2
1982

TAXON	SAMPLING DATE					
	MAY	JUNE	JULY	AUG	SEPT	OCT
BACILLARIOPHYTA						
ACHNANTHES LANCEOLATA	X		X		X	
ACHNANTHES LANCEOLATA VAR. DUBIA	X	X	X	X	X	X
ACHNANTHES LINEARIS	X	X	X	X	X	
ACHNANTHES MINUTISSIMA	X	X	X	X	X	X
AMPHORA OVALIS	X			X	X	
AMPHORA OVALIS VAR. AFFINIS				X		
AMPHORA PERPUSILLA	X	X	X	X	X	X
AMPHORA VENETA			X			
CALONEIS AMPHISBAENA	X	X				
CALONEIS SP.		X	X			
COCCONEIS PEDICULUS	X	X		X	X	X
COCCONEIS PLACENTULA VAR. EUGLYPTA				X		X
COCCONEIS PLACENTULA VAR. LINEATA	X	X	X	X	X	X
CYCLOTELLA KUTZINGIANA	X					
CYCLOTELLA MENEGHINIANA	X	X	X	X	X	X
CYMBELLA AFFINIS	X	X		X	X	X
CYMBELLA CYMBIFORMIS				X	X	
CYMBELLA LAEVIS		X				
CYMBELLA MICROCEPHALA	X					
CYMBELLA MINUTA VAR. SILESIACA	X	X	X	X	X	X
CYMBELLA SINUATA			X	X	X	X
DENTICULA SP.		X				
DIATOMA TENUE		X				
DIATOMA TENUE VAR. ELONGATUM	X	X		X		
DIATOMA VULGARE	X	X	X	X	X	X
FRAGILARIA CONSTRUENS						X
FRAGILAREA CONSTRUENS VAR. BINODIS	X	X	X		X	
FRAGILARIA CONSTRUENS VAR. VENTER		X			X	
FRAGILARIA LEPTOSTAURON	X	X		X	X	X
FRAGILARIA VAUCHERIAE	X	X	X	X	X	X
FRUSTULIA RHOMBOIDES					X	
GOMPHONEMA ANGUSTATUM	X					
GOMPHONEMA OLIVACEUM	X	X	X	X	X	X
GOMPHONEMA PARVULUM	X	X	X	X	X	X
GOMPHONEMA SUBCLAVATUM			X	X		X
GOMPHONEMA TENELLUM	X				X	X
GOMPHONEMA SP.	X			X		
GYROSIGMA SPENCERII		X		X	X	
HANTZSCHIA AMPHIOXYS	X		X	X	X	X
MERIDION CIRCULARE	X					
MERIDION CIRCULARE VAR. CONSTRICTUM		X				
NAVICULA ARVENSIS	X			X	X	X
NAVICULA CINCTA	X					
NAVICULA CRYPTOCEPHALA		X	X	X		
NAVICULA CRYPTOCEPHALA VAR. VENETA	X	X	X	X	X	X
NAVICULA CUSPIDATA			X	X		
NAVICULA HEUFLERI				X	X	X
NAVICULA MINIMA			X	X	X	X

NAVICULA MUTICA	X			X	X	
NAVICULA MUTICA VAR. UNDULATA		X		X	X	
NAVICULA NOTHA	X		X	X	X	X
NAVICULA PUPULA				X	X	
NAVICULA PUPULA VAR. CAPITATA		X				
NAVICULA RADIOSA	X					
NAVICULA RHYNCHOCEPHALA	X	X		X		
NAVICULA SALINARUM VAR. INTERMEDIA				X	X	X
NAVICULA SECRETA VAR. APICULATA	X	X	X	X	X	X
NAVICULA TRIPUNCTATA						X
NAVICULA TRIPUNCTATA VAR. SCHIZONEMOIDES	X	X	X	X	X	X
NAVICULA VIRIDULA			X			
NAVICULA VIRIDULA VAR. AVENACEA	X	X	X	X	X	X
NAVICULA SP.				X		
NITZSCHIA ACICULARIS	X				X	
NITZSCHIA AMPHIBIA				X	X	
NITZSCHIA APICULATA		X	X	X	X	X
NITZSCHIA CAPITELLATA	X	X	X			X
NITZSCHIA COMMUNIS	X		X			
NITZSCHIA DISSIPATA	X	X	X	X	X	X
NITZSCHIA FONTICOLA	X	X	X	X	X	
NITZSCHIA FRUSTULUM	X	X	X	X	X	X
NITZSCHIA GRACILIS		X				X
NITZSCHIA HUNGARICA		X				
NITZSCHIA IGNORATA						X
NITZSCHIA LINEARIS	X	X	X		X	X
NITZSCHIA PALEACEA		X	X			
NITZSCHIA PALEA	X	X	X	X	X	X
NITZSCHIA RECTA	X					
NITZSCHIA SIGMOIDEA		X	X		X	
NITZSCHIA TRYBLIONELLA VAR. LEVIDENSIS		X	X	X		X
NITZSCHIA SP.	X	X	X	X	X	X
PINNULARIA BREBISSONII	X			X	X	
PINNULARIA MICROSTAURON		X				
RHOICOSPHENIA CURVATA	X	X	X	X	X	X
RHOPALODIA GIBBA VAR. VENTRICOSA	X	X				
RHOPALODIA MUSCULUS		X	X			
STAURONEIS SMITHII					X	
STEPHANODISCUS TENUIS	X					
SURIRELLA ANGUSTATA					X	
SURIRELLA OVALIS	X	X		X		
SURIRELLA OVATA	X	X	X	X	X	X
SYNEDRA ACUS		X				X
SYNEDRA AMPHICEPHALA	X	X				
SYNEDRA DELICATISSIMA	X		X	X		X
SYNEDRA FASCICULATA				X	X	
SYNEDRA FASCICULATA VAR. TRUNCATA			X			
SYNEDRA MINUSCULA				X		
SYNEDRA PULCHELLA				X		
SYNEDRA RUMPENS VAR. FAMILIARIS				X		
SYNEDRA ULNA	X	X	X	X	X	X
SYNEDRA ULNA VAR. DANICA		X				
SYNEDRA SP.				X	X	
THALASSIOSIRA FLUVIATILIS		X	X	X		X
UNIDENTIFIED PENNATE DIATOMS	X	X	X	X	X	X
CHLOROPHYTA						
ANKISTRODESMUS SP.			X			
CHLAMYDOMONAS SP.		X	X			
CLOSTERIUM SP.				X		
COELASTRUM SP.		X				
UNIDENTIFIED GREEN COCCOID	X	X				
MOUGEOTIA SP.			X			

STIGEOCLONIUM TENUE		X	X	X		
CHRYSOPHYTA						
CYANOPHYTA						
ANABAENA SP.	X		X	X		
LYNGBYA SP.				X	X	X
MERISMOPEDEA SP.				X		
OSCILLATORIA TENVIS		X		X		
OSCILLATORIA SP.		X	X		X	
PHORMIDIUM SP.		X	X			
EUGLENOPHYTA						
EUGLENA SP.		X			X	
PHACUS SP.		X				
TRACHELOMONAS SP.			X			
RHODOPHYTA						

X = ORGANISM IDENTIFIED TO THIS TAXONOMIC LEVEL OBSERVED AT SAMPLING STATION

PERIPHYTON SPECIES LIST

CATHEDRAL BLUFFS SHALE OIL COMPANY
PICEANCE CREEK

SPECIES OCCURRENCE BY SAMPLING DATE AT STATION WP03
1982

TAXON	SAMPLING DATE					
	MAY	JUNE	JULY	AUG	SEPT	OCT
BACILLARIOPHYTA						
ACHNANTHES LANCEOLATA	X	X				X
ACHNANTHES LANCEOLATA VAR. DUBIA	X	X		X	X	X
ACHNANTHES LINEARIS	X	X				
ACHNANTHES MINUTISSIMA	X	X			X	X
AMPHORA OVALIS	X					
AMPHORA OVALIS VAR. AFFINIS					X	X
AMPHORA OVALIS VAR. PEDICULUS		X				
AMPHORA PERPUSILLA	X	X			X	X
CALONEIS AMPHISBAENA	X	X				
COCCONEIS PEDICULUS	X	X		X		
COCCONEIS PLACENTULA VAR. EUGLYPTA				X		
COCCONEIS PLACENTULA VAR. LINEATA	X	X		X	X	X
CYCLOTELLA MENEGHINIANA	X	X			X	X
CYMATOPLEURA SOLEA		X				
CYMBELLA AFFINIS	X	X		X	X	X
CYMBELLA CYMBIFORMIS						X
CYMBELLA MINUTA VAR. SILESIACA	X	X			X	X
CYMBELLA SINUATA	X					X
DENTICULA ELEGANS					X	
DIATOMA TENUE VAR. ELONGATUM				X		X
DIATOMA VULGARE	X	X		X	X	X
ENTOMONEIS ORNATA					X	
FRAGILAREA CONSTRUENS VAR. BINODIS					X	
FRAGILARIA CONSTRUENS VAR. VENTER	X					
FRAGILARIA LEPTOSTAURON		X			X	X
FRAGILARIA VAUCHERIAE	X	X		X	X	X
FRUSTULIA RHOMBOIDES					X	
GOMPHONEMA ANGUSTATUM		X				
GOMPHONEMA INTRICATUM				X		
GOMPHONEMA OLIVACEUM	X			X	X	X
GOMPHONEMA PARVULUM	X	X		X	X	X
GOMPHONEMA SUBCLAVATUM	X	X		X		X
GOMPHONEMA TENELLUM				X	X	X
GOMPHONEMA SP.		X			X	
GYROSIGMA SPENCERII		X				
HANTZSCHIA AMPHIOXYS	X	X			X	
MASTOGLOIA SPP.						X
NAVICULA ARVENSIS		X		X	X	
NAVICULA CRYPTOCEPHALA VAR. VENETA	X	X		X	X	X
NAVICULA CUSPIDATA		X				
NAVICULA HEUFLERI	X	X		X	X	X
NAVICULA LANCEOLATA VAR. DUBIA						X
NAVICULA LUZONENSIS		X				
NAVICULA MINIMA		X			X	X
NAVICULA MUTICA		X			X	X
NAVICULA MUTICA VAR. UNDULATA					X	
NAVICULA NOTHA	X				X	X
NAVICULA PUPULA		X			X	X

NAVICULA PUPULA VAR. CAPITATA				X	
NAVICULA PROTRACTA		X			
NAVICULA PYGMAEA	X				
NAVICULA SALINARUM VAR. INTERMEDIA				X	X
NAVICULA SECRETA VAR. APICULATA	X	X	X	X	X
NAVICULA TRIPUNCTATA VAR. SCHIZONEMOIDES	X			X	X
NAVICULA VIRIDULA VAR. AVENACEA	X	X	X	X	X
NAVICULA SP.					X
NITZSCHIA ACICULARIS	X				
NITZSCHIA APICULATA	X	X	X	X	X
NITZSCHIA DISSIPATA	X	X	X	X	X
NITZSCHIA FONTICOLA	X	X	X		
NITZSCHIA FRUSTULUM	X	X	X	X	X
NITZSCHIA HUNGARICA	X	X		X	X
NITZSCHIA LINEARIS	X	X			
NITZSCHIA PALEACEA		X			
NITZSCHIA PALEA	X	X			X
NITZSCHIA SIGMOIDEA		X			X
NITZSCHIA TRYBLIONELLA VAR. LEVIDENSIS		X	X		
NITZSCHIA SP.	X	X		X	
PINNULARIA BREBISSONII				X	X
PINNULARIA VIRIDIS VAR. MINOR		X			
PINNULARIA SP.		X			
RHOICOSPHENIA CURVATA	X	X	X	X	X
RHOPALODIA GIBBA VAR. VENTRICOSA		X			
RHOPALODIA MUSCULUS		X		X	X
STAURONEIS ANICEPS				X	
STEPHANODISCUS SP.				X	X
SURIRELLA OVALIS	X	X			
SURIRELLA OVATA	X	X	X	X	X
SYNEDRA ACUS				X	X
SYNEDRA AMPHICEPHALA	X				X
SYNEDRA DELICATISSIMA		X			
SYNEDRA FASCICULATA	X				
SYNEDRA PULCHELLA		X		X	
SYNEDRA ULNA	X	X		X	X
THALASSIOSIRA FLUVIATILIS	X	X		X	
UNIDENTIFIED PENNATE DIATOMS		X		X	X
CHLOROPHYTA					
CHLAMYDOMONAS SP.			X		
OEDOGONIUM SP.			X		
STIGEOCLONIUM TENUE		X	X	X	
UNIDENTIFIED FILAMENT	X				
CHRYSOPHYTA					
CYANOPHYTA					
ANABAENA SP.			X		X
CHROOCOCCUS SP.			X		
LYNGBYA SP.			X		
OSCILLATORIA TENVIS		X			
OSCILLATORIA SP.		X			
EUGLENOPHYTA					
RHODOPHYTA					

X = ORGANISM IDENTIFIED TO THIS TAXONOMIC LEVEL OBSERVED AT SAMPLING STATION

TABLE 2.5.2-11

PERIPHYTON BENCH SHEET

CATHEDRAL BLUFFS SHALE OIL COMPANY
PICEANCE CREEK

SAMPLE STATION: WP01 - STEWART
NUMBER OF REPLICATES - 3

REPLICATE - 1
SAMPLE DATE - 06-01-82

C - 592 V - 110 ML DF - 1:0 L - 50 MM W - .33 MM D - 1 MM S - .5 A - 3750 MM2
SUBSTRATE - GLASS SLIDES

LOG NUMBER - 158-PA1 ANALYST - FHB

TAXON CODE	TAXON	NUMBER COUNTED DIATOMS PROPORTIONAL COUNT	NUMBER COUNTED NON-DIATOMS SEDGWICK-RAFTER COUNT
1SKPOT	SKELETONEMA POTAMOS	4	
1NAARV	NAVICULA ARVENSIS	1	
1NAVIA	NAVICULA VIRIDULA VAR. AVENACEA	108	
1COCPU	COCCONEIS PLACENTULA VAR. EUGLYPTA	2	
1ACMIN	ACHNANTHES MINUTISSIMA	30	
1CYMMS	CYMBELLA MINUTA VAR. SILESIACA	P	
1NIDIS	NITZSCHIA DISSIPATA	5	
1ACLAD	ACHNANTHES LANCEOLATA VAR. DUBIA	6	
1SUOVA	SURIRELLA OVATA	5	
1RHCUR	RHOICOSPHENIA CURVATA	9	
1CYCME	CYCLOTELLA MENEGHINIANA	P	
1NANOT	NAVICULA NOTHA	P	
1NIPAL	NITZSCHIA PALEA	4	
1NASEA	NAVICULA SECRETA VAR. APICULATA	6	
1COCPI	COCCONEIS PLACENTULA VAR. LINEATA	1	
1NACRV	NAVICULA CRYPTOCEPHALA VAR. VENETA	5	
1NIFRU	NITZSCHIA FRUSTULUM	1	
1UNPEN	UNIDENTIFIED PENNATE DIATOMS	2	
1NISPP	NITZSCHIA SP.	4	
1FRAVA	FRAGILARIA VAUCHERIAE	1	
1NIFON	NITZSCHIA FONTICOLA	1	
1FRACR	FRAGILARIA CROTONENSIS	2	
1CYMSI	CYMBELLA SINUATA	2	
1NIAPI	NITZSCHIA APICULATA	3	
1SYAMP	SYNEDRA AMPHICEPHALA	2	
1DIVUL	DIATOMA VULGARE	P	
1GYSPE	GYROSIGMA SPENCERII	P	
1MERCI	MERIDION CIRCULARE	P	
1SYULN	SYNEDRA ULNA	P	
1NATSC	NAVICULA TRIPUNCTATA VAR. SCHIZONEMOIDES	P	
1AMPER	AMPHORA PERPUSILLA	P	
1NISIE	NITZSCHIA SIGMOIDEA	P	
1FRACB	FRAGILAREA CONSTRUENS VAR. BINODIS	P	
1SUOVL	SURIRELLA OVALIS	P	
1NAMUU	NAVICULA MUTICA VAR. UNDULATA	P	
1EPSOR	EPITHEMIA SOREX	P	
1FRALE	FRAGILARIA LEPTOSTAURON	P	
1ACLIN	ACHNANTHES LINEARIS	P	

SAMPLE STATION: WP01 - STEWART
NUMBER OF REPLICATES - 3

REPLICATE - 2
SAMPLE DATE - 06-01-82

C - 1089 V - 110 ML DF - 1:0 L - 50 MM W - .17 MM D - 1 MM S - 1 A - 3750 MM2
SUBSTRATE - GLASS SLIDES

LOG NUMBER - 159-PA2 ANALYST - FHB

TAXON CODE	TAXON	NUMBER COUNTED DIATOMS PROPORTIONAL COUNT	NUMBER COUNTED NON-DIATOMS SEDGWICK-RAFTER COUNT
1FRAVA	FRAGILARIA VAUCHERIAE	P	
1SUOVA	SURIRELLA OVATA	3	
1NAVIA	NAVICULA VIRIDULA VAR. AVENACEA	125	
1NATSC	NAVICULA TRIPUNCTATA VAR. SCHIZONEMOIDES	1	
1GOPAR	GOMPHONEMA PARVULUM	4	
1ACMIN	ACHNANTHES MINUTISSIMA	21	
1FRAVA	FRAGILARIA VAUCHERIAE	2	
1ACLAD	ACHNANTHES LANCEOLATA VAR. DUBIA	4	
1NIDIS	NITZSCHIA DISSIPATA	7	
1NIFON	NITZSCHIA FONTICOLA	2	
1CYMMS	CYMBELLA MINUTA VAR. SILESIACA	3	
1CYMMI	CYMBELLA MINUTA	1	
1CYMSI	CYMBELLA SINUATA	2	
1NACPV	NAVICULA CRYPTOCEPHALA VAR. VENETA	4	
1NAPUR	NAVICULA PUPULA VAR. RECTANGULARIS	1	
1NANOT	NAVICULA NOTHA	1	
1NAPEL	NAVICULA PELLICULOSA	2	
1NIPAL	NITZSCHIA PALEA	5	
1RHCUR	RHOICOSPHENIA CURVATA	1	
1NISPP	NITZSCHIA SP.	2	
1NIIGN	NITZSCHIA IGNORATA	1	
1UNPEN	UNIDENTIFIED PENNATE DIATOMS	4	
1NIFRU	NITZSCHIA FRUSTULUM	3	
1NASEA	NAVICULA SECRETA VAR. APICULATA	2	
1GYSPE	GYROSIGMA SPENCERII	P	
1CYCME	CYCLOTELLA MENEGHINIANA	P	

SAMPLE STATION: WP01 - STEWART
NUMBER OF REPLICATES - 3

REPLICATE - 3
SAMPLE DATE - 06-01-82

C - 1202 V - 110 ML DF - 1:0 L - 50 MM W - .17 MM D - 1 MM S - 1 A - 3750 MM2
SUBSTRATE - GLASS SLIDES

LOG NUMBER - 158-PA3 ANALYST - FHB

TAXON CODE	TAXON	NUMBER COUNTED DIATOMS PROPORTIONAL COUNT	NUMBER COUNTED NON-DIATOMS SEDGWICK-RAFTER COUNT
2UNFIL	UNIDENTIFIED FILAMENT		3
1NAVIA	NAVICULA VIRIDULA VAR. AVENACEA	150	
1SUOVA	SURIRELLA OVATA	3	
1GOOLI	GOMPHONEMA OLIVACEUM	5	
1ACMIN	ACHNANTHES MINUTISSIMA	30	
1RHCUR	RHOICOSPHENIA CURVATA	12	
1SYULN	SYNEDRA ULNA	P	
1GOPAR	GOMPHONEMA PARVULUM	P	
1AMOVP	AMPHORA OVALIS	P	
1NIDIS	NITZSCHIA DISSIPATA	5	
1DIVUL	DIATOMA VULGARE	1	
1SYAMP	SYNEDRA AMPHICEPHALA	1	
1NIFON	NITZSCHIA FONTICOLA	4	
1NIPAL	NITZSCHIA PALEA	5	
1FRAVA	FRAGILARIA VAUCHERIAE	1	
1NACRV	NAVICULA CRYPTOCEPHALA VAR. VENETA	3	
1ACLIN	ACHNANTHES LINEARIS	2	
1COCPI	COCCONEIS PLACENTULA VAR. LINEATA	1	
1CYMSI	CYMBELLA SINUATA	4	
1NIACI	NITZSCHIA ACICULARIS	P	
1MERCI	MERIDION CIRCULARE	1	
1UNPEN	UNIDENTIFIED PENNATE DIATOMS	3	
1NIAMP	NITZSCHIA AMPHIBIA	3	
1NASEA	NAVICULA SECRETA VAR. APICULATA	10	
1NISPP	NITZSCHIA SP.	5	
1COCPU	COCCONEIS PLACENTULA VAR. EUGLYPTA	1	
1NIKUT	NITZSCHIA KUTZINGIANA	1	
1AMPER	AMPHORA PERPUSILLA	1	
1GOTEN	GOMPHONEMA TENELLUM	2	
1HANAM	HANTZSCHIA AMPHIOXYS	P	

SAMPLE STATION: WP02 - MIDDLE
NUMBER OF REPLICATES - 3

REPLICATE - 1
SAMPLE DATE - 06-01-82

C - 564 V - 110 ML DF - 1:19 L - 50 MM W - .33 MM D - 1 MM S - 1 A - 3750 MM2
SUBSTRATE - GLASS SLIDES

LOG NUMBER - 158-PA4 ANALYST - FHB

NUMBER COUNTED

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                                                                DIATOMS              NON-DIATOMS
TAXUN CODE   TAXON                                        PROPORTIONAL COUNT   SEDGWICK-RAFTER COUNT
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   INACRV    NAVICULA CRYPTOCEPHALA VAR. VENETA                   2
   INAVIA    NAVICULA VERIDULA VAR. AVENACEA                      101
   1SUOVA    SURIRELLA OVATA                                      5
   1CYCME    CYCLOTELLA MENEGHINIANA                              4
   1NIDIS    NITZSCHIA DISSIPATA                                  17
   INATSC    NAVICULA TRIPUNCTATA VAR. SCHIZONEMOIDES             3
   1NASEA    NAVICULA SECRETA VAR. APICULATA                      5
   1COCPE    COCCONEIS PEDICULUS                                  P
   1NIREC    NITZSCHIA RECTA                                      P
   IACLIN    ACHNANTHES LINEARIS                                  2
   1NIFON    NITZSCHIA FONTICOLA                                  4
   1COCPI    COCCONEIS PLACENTULA VAR. LINEATA                    2
   1GOOLI    GOMPHONEMA OLIVACEUM                                 P
   1ACMIN    ACHNANTHES MINUTISSIMA                               11
   INAMUT    NAVICULA MUTICA                                      P
   IACLAD    ACHNANTHES LANCEOLATA VAR. DUBIA                     7
   1UNPEN    UNIDENTIFIED PENNATE DIATOMS                         3
   1AMPER    AMPHORA PERPUSILLA                                   2
   1SYAMP    SYNEDRA AMPHICEPHALA                                 1
   INISPP    NITZSCHIA SP.                                        2
   1NACIN    NAVICULA CINCTA                                      2
   1NISPP    NITZSCHIA SP.                                        3
   1NAARV    NAVICULA ARVENSIS                                    2
   1RHCUR    RHOICOSPHENIA CURVATA                                2
   1GOANG    GOMPHONEMA ANGUSTATUM                                1
   1NIACI    NITZSCHIA ACICULARIS                                 2
   1FRACB    FRAGILAREA CONSTRUENS VAR. BINODIS                   7
   1SYDEL    SYNEDRA DELICATISSIMA                                1
   1CYMMS    CYMBELLA MINUTA VAR. SILESIACA                       2
   1FRALE    FRAGILARIA LEPTOSTAURON                              P
   IMERCI    MERIDION CIRCULARE                                   P
   1SYULN    SYNEDRA ULNA                                         P
   1AMOVP    AMPHORA OVALIS                                       P
   1PIBRE    PINNULARIA BREBISSONII                               P
   1RHGIN    RHOPALODIA GIBBA VAR. VENTRICOSA                     P

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SAMPLE STATIUN: WP02 - MIDDLE
NUMBER OF REPLICATES - 3

REPLICATE - 2
SAMPLE DATE - 06-01-82

C - 442     V - 110 ML   DF - 1:49    L = 50 MM   W = .33  MM   D - 1  MM   S - 2    A - 3750 MM2
SUBSTRATE - GLASS SLIDES

LOG NUMBER - 158-PA5       ANALYST = FHB

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                                                                 NUMBER COUNTED
                                                                 --------------

                                                              DIATOMS              NON-DIATOMS
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TAXON CODE   TAXON                                        PROPORTIONAL COUNT   SEDGWICK-RAFTER COUNT
-----------------------------------------------------------------------------------------------------

  2GRCOC    UNIDENTIFIED GREEN COCCOID                                                  1
  4ANASP    ANABAENA SP.                                                                1
  1NACRV    NAVICULA CRYPTOCEPHALA VAR. VENETA                   6
  1NAVIA    NAVICULA VIRIDULA VAR. AVENACEA                      112
  1ACLAD    ACHNANTHES LANCEOLATA VAR. DUBIA                     7
  1ACMIN    ACHNANTHES MINUTISSIMA                               18
  1ACLIN    ACHNANTHES LINEARIS                                  4
  1RHCUR    RHOICOSPHENIA CURVATA                                6
  1NASFA    NAVICULA SECRETA VAR. APICULATA                      6
  1NIFRU    NITZSCHIA FRUSTULUM                                  P
  1NIFON    NITZSCHIA FONTICOLA                                  3
  1NIPAL    NITZSCHIA PALEA                                      2
  1FRAVA    FRAGILARIA VAUCHERIAE                                1
  1NIDIS    NITZSCHIA DISSIPATA                                  14
  1COCPI    COCCONEIS PLACENTULA VAR. LINEATA                    P
  1CYMMC    CYMBELLA MICROCEPHALA                                2
  1SUOVA    SURIRELLA OVATA                                      3
  1CYCME    CYCLOTELLA MENEGHINIANA                              1
  1NANOT    NAVICULA NOTHA                                       P
  1AMPER    AMPHORA PERPUSILLA                                   P
  1NACIN    NAVICULA CINCTA                                      2
  1NISPP    NITZSCHIA SP.                                        2
  1GOOLI    GOMPHONEMA OLIVACEUM                                 P
  1SYAMP    SYNEDRA AMPHICEPHALA                                 P
  1CYCKU    CYCLOTELLA KUTZINGIANA                               P
  1HANAM    HANTZSCHIA AMPHIOXYS                                 P
  1NICAP    NITZSCHIA CAPITELLATA                                1
  1GOTEN    GOMPHONEMA TENELLUM                                  1
  1CYMAF    CYMBELLA AFFINIS                                     1
  1ACLAN    ACHNANTHES LANCEOLATA                                1
  1GOSPP    GOMPHONEMA SP.                                       1
  1STTEN    STEPHANODISCUS TENUIS                                P
  1CYMMS    CYMBELLA MINUTA VAR. SILESIACA                       2
  1NICOM    NITZSCHIA COMMUNIS                                   1
  1NARAD    NAVICULA RADIOSA                                     2
  1UNPEN    UNIDENTIFIED PENNATE DIATOMS                         1
  1CAAMP    CALONEIS AMPHISBAENA                                 2
  1NIACI    NITZSCHIA ACICULARIS                                 2
  1DIVUL    DIATOMA VULGARE                                      P
  1SUOVL    SURIRELLA OVALIS                                     P

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SAMPLE STATION: WP02 - MIDDLE
NUMBER OF REPLICATES - 3

REPLICATE - 3
SAMPLE DATE - 06-01-82

C - 489     V - 110 ML    DF - 1:49     L - 50 MM     W - .33  MM    D - 1  MM    S - 2    A - 3750 MM2
SUBSTRATE - GLASS SLIDES

LOG NUMBER - 158-PA6      ANALYST - FHB

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                                                          NUMBER COUNTED
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TAXON CODE	TAXON	DIATOMS PROPORTIONAL COUNT	NON-DIATOMS SEDGWICK-RAFTER COUNT
4ANASP	ANABAENA SP.		1
1NIDIS	NITZSCHIA DISSIPATA	18	
1NAARV	NAVICULA ARVENSIS	2	
1MERCI	MERIDION CIRCULARE	P	
1SUOVA	SURIRELLA OVATA	2	
1NAVIA	NAVICULA VIRIDULA VAR. AVENACEA	106	
1ACMIN	ACHNANTHES MINUTISSIMA	32	
1NIFRU	NITZSCHIA FRUSTULUM	3	
1FRAVA	FRAGILARIA VAUCHERIAE	1	
1NIFON	NITZSCHIA FONTICOLA	4	
1ACLAD	ACHNANTHES LANCEOLATA VAR. DUBIA	6	
1NISPP	NITZSCHIA SP.	10	
1NASEA	NAVICULA SECRETA VAR. APICULATA	6	
1SYDEL	SYNEDRA DELICATISSIMA	P	
1CYCME	CYCLOTELLA MENEGHINIANA	4	
1HANAM	HANTZSCHIA AMPHIOXYS	P	
1GOTEN	GOMPHONEMA TENELLUM	P	
1RHCUR	RHOICOSPHENIA CURVATA	6	
1NACRV	NAVICULA CRYPTOCEPHALA VAR. VENETA	2	
1AMPER	AMPHORA PERPUSILLA	8	
1ACLIN	ACHNANTHES LINEARIS	8	
1NACIN	NAVICULA CINCTA	3	
1COCPI	COCCONEIS PLACENTULA VAR. LINEATA	1	
1NIPAL	NITZSCHIA PALEA	4	
1SYAMP	SYNEDRA AMPHICEPHALA	2	
1NARHY	NAVICULA RHYNCHOCEPHALA	1	
1UNPEN	UNIDENTIFIED PENNATE DIATOMS	7	
1NILIN	NITZSCHIA LINEARIS	2	
1NICOM	NITZSCHIA COMMUNIS	2	
1RHGIN	RHOPALODIA GIBBA VAR. VENTRICOSA	P	
1NATSC	NAVICULA TRIPUNCTATA VAR. SCHIZONEMOIDES	P	
1GOOLI	GOMPHONEMA OLIVACEUM	P	
1SUOVL	SURIRELLA OVALIS	P	
1NAMUT	NAVICULA MUTICA	P	
1CYMMS	CYMBELLA MINUTA VAR. SILESIACA	P	
1FRALE	FRAGILARIA LEPTOSTAURON	P	
1GOPAR	GOMPHONEMA PARVULUM	P	
1CYMAF	CYMBELLA AFFINIS	P	
1DITEE	DIATOMA TENUE VAR. ELONGATUM	P	
1SYULN	SYNEDRA ULNA	P	

SAMPLE STATION: WP03 - HUNTER
NUMBER OF REPLICATES - 3

REPLICATE - 1
SAMPLE DATE - 06-01-82

C - 343 V - 110 ML DF - 1:49 L - 50 MM W - .33 MM D - 1 MM S - 2 A - 3750 MM2
SUBSTRATE - GLASS SLIDES

LOG NUMBER - 158-PA7 ANALYST - FHB

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                                                                            NUMBER COUNTED
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                                                                   DIATOMS              NON-DIATOMS
TAXON CODE   TAXON                                           PROPORTIONAL COUNT   SEDGWICK-RAFTER COUNT
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   1NAVIA   NAVICULA VIRIDULA VAR. AVENACEA                       100
   1COCPE   COCCONEIS PEDICULUS                                   P
   1NASEA   NAVICULA SECRETA VAR. APICULATA                       8
   1SUOVA   SURIRELLA OVATA                                       1
   1NIHUN   NITZSCHIA HUNGARICA                                   P
   1COCPI   COCCONEIS PLACENTULA VAR. LINEATA                     P
   1NACRV   NAVICULA CRYPTOCEPHALA VAR. VENETA                    7
   1NIFON   NITZSCHIA FONTICOLA                                   10
   1NILIN   NITZSCHIA LINEARIS                                    1
   1NIDIS   NITZSCHIA DISSIPATA                                   6
   1GOOLI   GOMPHONEMA OLIVACEUM                                  2
   1SYFAS   SYNEDRA FASCICULATA                                   P
   1NISPP   NITZSCHIA SP.                                         16
   1CYCME   CYCLOTELLA MENEGHINIANA                               3
   1NANOT   NAVICULA NOTHA                                        2
   1SYULN   SYNEDRA ULNA                                          P
   1FRACV   FRAGILARIA CONSTRUENS VAR. VENTER                     P
   1NIAPI   NITZSCHIA APICULATA                                   P
   1GOPAR   GOMPHONEMA PARVULUM                                   1
   1NIPAL   NITZSCHIA PALEA                                       18
   1NIACI   NITZSCHIA ACICULARIS                                  P
   1RHCUR   RHOICOSPHENIA CURVATA                                 5
   1ACMIN   ACHNANTHES MINUTISSIMA                                7
   1SUOVL   SURIRELLA OVALIS                                      2
   1FRAVA   FRAGILARIA VAUCHERIAE                                 5
   1AMPER   AMPHORA PERPUSILLA                                    1
   1NIFRU   NITZSCHIA FRUSTULUM                                   2
   1SYAMP   SYNEDRA AMPHICEPHALA                                  1
   1THSPP   THALASSIOSIRA FLUVIATILIS                             1
   1ACLAD   ACHNANTHES LANCEOLATA VAR. DUBIA                      1

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SAMPLE STATION: WP03 - HUNTER
NUMBER OF REPLICATES - 3

REPLICATE - 2
SAMPLE DATE - 06-01-82

C - 338     V - 110 ML   DF - 1:49    L - 50 MM   W - .33  MM   D - 1  MM   S - 2    A - 3750 MM2
SUBSTRATE - GLASS SLIDES

LOG NUMBER - 158-PA8       ANALYST - FHB

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                                                                            NUMBER COUNTED
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                                                                   DIATOMS              NON-DIATOMS
TAXON CODE   TAXON                                           PROPORTIONAL COUNT   SEDGWICK-RAFTER COUNT
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   1HANAM   HANTZSCHIA AMPHIOXYS                                  P
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  1ACLAN   ACHNANTHES LANCEOLATA                                            P
  1NISPP   NITZSCHIA SP.                                                    P
  1COCPI   COCCONEIS PLACENTULA VAR. LINEATA                                1
  1RHCUR   RHOICOSPHENIA CURVATA                                            4
  1NAVIA   NAVICULA VIRIDULA VAR. AVENACEA                                  130
  1GOPAR   GOMPHONEMA PARVULUM                                              2
  1NIFON   NITZSCHIA FONTICOLA                                              14
  1FRAVA   FRAGILARIA VAUCHERIAE                                            3
  1ACMIN   ACHNANTHES MINUTISSIMA                                           8
  1NIPAL   NITZSCHIA PALEA                                                  36
  1CYCME   CYCLOTELLA MENEGHINIANA                                          4
  1NACRV   NAVICULA CRYPTOCEPHALA VAR. VENETA                               3
  1NIFRU   NITZSCHIA FRUSTULUM                                              8
  1SUOVA   SURIRELLA OVATA                                                  11
  1NIHUN   NITZSCHIA HUNGARICA                                              2
  1NASEA   NAVICULA SECRETA VAR. APICULATA                                  4
  1NANOT   NAVICULA NOTHA                                                   1
  1AMPER   AMPHORA PERPUSILLA                                               3
  1ACLIN   ACHNANTHES LINEARIS                                              2
  1SUOVL   SURIRELLA OVALIS                                                 P
  1NISPP   NITZSCHIA SP.                                                    3
  1NIDIS   NITZSCHIA DISSIPATA                                              4
  1NAHEU   NAVICULA HEUFLERI                                                1
  1NILIN   NITZSCHIA LINEARIS                                               2
  1AMOVP   AMPHORA OVALIS                                                   1
  1SYAMP   SYNEDRA AMPHICEPHALA                                             P
  1GOOLI   GOMPHONEMA OLIVACEUM                                             1
  1CYMAF   CYMBELLA AFFINIS                                                 1
  1GOSUB   GOMPHONEMA SUBCLAVATUM                                           2
  1ACLAD   ACHNANTHES LANCEOLATA VAR. DUBIA                                 P
  1NAPYG   NAVICULA PYGMAEA                                                 P
  1NIACI   NITZSCHIA ACICULARIS                                             P
  1NIAPI   NITZSCHIA APICULATA                                              P

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SAMPLE STATION: WPO3 - HUNTER
NUMBER OF REPLICATES - 3

REPLICATE - 3
SAMPLE DATE - 06-01-82

C - 301     V - 110 ML    DF - 1:49    L - 50 MM    W - .33  MM    D - 1  MM    S - 2    A - 3750 MM2
SUBSTRATE - GLASS SLIDES

LOG NUMBER - 158-PA9       ANALYST - FHB

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                                                                  NUMBER COUNTED
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                                                            DIATOMS               NON-DIATOMS
TAXON CODE    TAXON                                   PROPORTIONAL COUNT   SEDGWICK-RAFTER COUNT
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  2UNFIL   UNIDENTIFIED FILAMENT                                                     1
  1NASEA   NAVICULA SECRETA VAR. APICULATA                  6
  1NAVIA   NAVICULA VIRIDULA VAR. AVENACEA                  100
  1NIPAL   NITZSCHIA PALEA                                  33
  1RHCUR   RHOICOSPHENIA CURVATA                            3
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1NIDIS   NITZSCHIA DISSIPATA                              2
1SUOVA   SURIRELLA OVATA                                  5
1FRAVA   FRAGILARIA VAUCHERIAE                            P
1ACLAD   ACHNANTHES LANCEOLATA VAR. DUBIA                 3
1GOOLI   GOMPHONEMA OLIVACEUM                             2
1NIFRU   NITZSCHIA FRUSTULUM                              P
1CYCME   CYCLOTELLA MENEGHINIANA                          2
1AMPER   AMPHORA PERPUSILLA                               1
1COCPI   COCCONEIS PLACENTULA VAR. LINEATA                P
1SUOVL   SURIRELLA OVALIS                                 1
1NIHUN   NITZSCHIA HUNGARICA                              2
1DIVUL   DIATOMA VULGARE                                  1
1NACRV   NAVICULA CRYPTOCEPHALA VAR. VENETA               9
1GOPAR   GOMPHONEMA PARVULUM                              3
1ACMIN   ACHNANTHES MINUTISSIMA                           7
1CYMMS   CYMBELLA MINUTA VAR. SILESIACA                   P
1NISPP   NITZSCHIA SP.                                    5
1NIAPI   NITZSCHIA APICULATA                              1
1GOSUB   GOMPHONEMA SUBCLAVATUM                           P
1NIFON   NITZSCHIA FONTICOLA                              4
1NILIN   NITZSCHIA LINEARIS                               P
1SYULN   SYNEDRA ULNA                                     1
1NATSC   NAVICULA TRIPUNCTATA VAR. SCHIZONEMOIDES         2
1NAHEU   NAVICULA HEUFLERI                                2
1CAAMP   CALONEIS AMPHISBAENA                             1
1CYMSI   CYMBELLA SINUATA                                 2
1ACLIN   ACHNANTHES LINEARIS                              2
1COCPE   COCCONEIS PEDICULUS                              P
1AMOVP   AMPHORA OVALIS                                   P
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PERIPHYTON BENCH SHEET

CATHEDRAL BLUFFS SHALE OIL COMPANY
PICEANCE CREEK

SAMPLE STATION: WP01 - STEWART
NUMBER OF REPLICATES - 3

REPLICATE - 1
SAMPLE DATE - 06-30-82

C - 246 V - 100 ML DF - 1:49 L - 50 MM W - .561 MM D - 1 MM S - 2 A - 3750 MM2
SUBSTRATE - GLASS SLIDES

LOG NUMBER - 158-PALO ANALYST - FHB

		NUMBER COUNTED	
		DIATOMS	NON-DIATOMS
TAXON CODE	TAXON	PROPORTIONAL COUNT	SEDGWICK-RAFTER COUNT
1RHCUR	RHOICOSPHENIA CURVATA	20	
1NAVIA	NAVICULA VIRIDULA VAR. AVENACEA	90	
1ACMIN	ACHNANTHES MINUTISSIMA	27	
1AMPCR	AMPHORA PERPUSILLA	2	
1NIDIS	NITZSCHIA DISSIPATA	6	
1GOOLI	GOMPHONEMA OLIVACEUM	10	
1NACRV	NAVICULA CRYPTOCEPHALA VAR. VENETA	4	
1SYULN	SYNEDRA ULNA	6	
1SYACU	SYNEDRA ACUS	10	
1ACLAD	ACHNANTHES LANCEOLATA VAR. DUBIA	1	
1NILIN	NITZSCHIA LINEARIS	4	
1NIFON	NITZSCHIA FONTICOLA	9	
1NASEA	NAVICULA SECRETA VAR. APICULATA	10	
1CYCME	CYCLOTELLA MENEGHINIANA	7	
1NIPAL	NITZSCHIA PALEA	4	
1NIFRU	NITZSCHIA FRUSTULUM	6	
1NICAP	NITZSCHIA CAPITELLATA	1	
1SYAMP	SYNEDRA AMPHICEPHALA	2	
1NAMIS	NAVICULA MINUSCULA	2	
1NIACI	NITZSCHIA ACICULARIS	2	
1THSPP	THALASSIOSIRA FLUVIATILIS	2	
1NIPAC	NITZXCHIA PALEACEA	1	
1NAMUT	NAVICULA MUTICA	1	
1NISPP	NITZSCHIA SP.	4	
1NACRY	NAVICULA CRYPTOCEPHALA	1	
1COCPE	COCCONEIS PEDICULUS	P	
4ANASP	ANABAENA SP.		P
4PHSPP	PHORMIDIUM SP.		P
1FRACR	FRAGILARIA CROTONENSIS	P	

SAMPLE STATION: WP01 - STEWART
NUMBER OF REPLICATES - 3

```
REPLICATE - 2
SAMPLE DATE - 06-30-82

C - 420     V - 100 ML    DF - 1:49    L - 50 MM    W - .561 MM    D - 1  MM    S - 2    A - 3750 MM2
SUBSTRATE - GLASS SLIDES

LOG NUMBER - 158-PA11     ANALYST - FHB

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                                                                         NUMBER COUNTED
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                                                                   DIATOMS              NON-DIATOMS
TAXON CODE   TAXON                                            PROPORTIONAL COUNT    SEDGWICK-RAFTER COUNT
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  1SYACU   SYNEDRA ACUS                                                11
  1NAVIA   NAVICULA VIRIDULA VAR. AVENACEA                             59
  1NIDIS   NITZSCHIA DISSIPATA                                         15
  1SYULN   SYNEDRA ULNA                                                9
  1NIFRU   NITZSCHIA FRUSTULUM                                         1
  1NIPAC   NITZXCHIA PALEACEA                                          10
  1RHCUR   RHOICOSPHENIA CURVATA                                       20
  1NIPAL   NITZSCHIA PALEA                                             6
  1NIACI   NITZSCHIA ACICULARIS                                        4
  1NACRV   NAVICULA CRYPTOCEPHALA VAR. VENETA                          2
  1RHMUS   RHOPALODIA MUSCULUS                                         2
  1NASEA   NAVICULA SECRETA VAR. APICULATA                             5
  1NISPP   NITZSCHIA SP.                                               10
  1ACMIN   ACHNANTHES MINUTISSIMA                                      14
  1NACRY   NAVICULA CRYPTOCEPHALA                                      2
  1GOOLI   GOMPHONEMA OLIVACEUM                                        16
  1FRAVA   FRAGILARIA VAUCHERIAE                                       3
  1NILIN   NITZSCHIA LINEARIS                                          2
  1COCPI   COCCONEIS PLACENTULA VAR. LINEATA                           5
  1NIFON   NITZSCHIA FONTICOLA                                         6
  1NICOM   NITZSCHIA COMMUNIS                                          1
  1NIAPI   NITZSCHIA APICULATA                                         4
  1DEELE   DENTICULA ELEGANS                                           2
  1SUOVA   SURIRELLA OVATA                                             P
  1CYCME   CYCLOTELLA MENEGHINIANA                                     P
  4PHSPP   PHORMIDIUM SP.                                                                    8
  2STITE   STIGEOCLONIUM TENUE                                                               9
  4OSTEN   OSCILLATORIA TENVIS                                                               7
  1CYMMI   CYMBELLA MINUTA                                             P
  1GOPAP   GOMPHONEMA PARVULUM                                         P
  1DIVUL   DIATOMA VULGARE                                             P
  5EUACU   EUGLENA ACUS                                                                      P

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SAMPLE STATION: WP01 - STEWART
NUMBER OF REPLICATES - 3

REPLICATE - 3
SAMPLE DATE - 06-30-82

C - 205     V - 100 ML    DF - 1:49    L - 50 MM    W - .561 MM    D - 1  MM    S - 2    A - 3750 MM2
SUBSTRATE - GLASS SLIDES
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LOG NUMBER - 158-PA12     ANALYST - FHB

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                                                                NUMBER COUNTED
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                                                            DIATOMS             NON-DIATOMS
TAXON CODE   TAXON                                    PROPORTIONAL COUNT  SEDGWICK-RAFTER COUNT
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  1NAVIA   NAVICULA VIRIDULA VAR. AVENACEA                    50
  1SYULN   SYNEDRA ULNA                                        7
  1NICOM   NITZSCHIA COMMUNIS                                  4
  1NIACI   NITZSCHIA ACICULARIS                                3
  1NACRV   NAVICULA CRYPTOCEPHALA VAR. VENETA                  9
  1NIFRU   NITZSCHIA FRUSTULUM                                 2
  1NISPP   NITZSCHIA SP.                                      13
  1ACMIN   ACHNANTHES MINUTISSIMA                             36
  1ACLIN   ACHNANTHES LINEARIS                                 2
  1SYACU   SYNEDRA ACUS                                        6
  1CYCME   CYCLOTELLA MENEGHINIANA                             2
  1GOOLI   GOMPHONEMA OLIVACEUM                                2
  1RHCUR   RHOICOSPHENIA CURVATA                              17
  1UNPEN   UNIDENTIFIED PENNATE DIATOMS                        5
  1NIPAC   NITZXCHIA PALEACEA                                 26
  1NASEA   NAVICULA SECRETA VAR. APICULATA                     6
  1NILIN   NITZSCHIA LINEARIS                                  2
  1NICAP   NITZSCHIA CAPITELLATA                               3
  1NIDIS   NITZSCHIA DISSIPATA                                18
  1ACLAD   ACHNANTHES LANCEOLATA VAR. DUBIA                    1
  1NIFON   NITZSCHIA FONTICOLA                                15
  1NIAMP   NITZSCHIA AMPHIBIA                                  1
  1NIPAL   NITZSCHIA PALEA                                     3
  1FRAVA   FRAGILARIA VAUCHERIAE                               3
  1COCPI   COCCONEIS PLACENTULA VAR. LINEATA                   P
  4OSTEN   OSCILLATORIA TENUIS                                                    P
  2CLOSP   CLOSTERIUM SP.                                                         P
  2STITE   STIGEOCLONIUM TENUE                                                    9
  4PHSPP   PHORMIDIUM SP.                                                         6
  4ANASP   ANABAENA SP.                                                           1
  1CAAMP   CALONEIS AMPHISBAENA                                P

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SAMPLE STATION: WP02 - MIDDLE
NUMBER OF REPLICATES - 3

REPLICATE - 1
SAMPLE DATE - 05-30-82

C - 176     V - 100 ML    DF - 1:49    L - 50 MM    W - .561 MM    D - 1  MM    S - 3    A - 3750 MM2
SUBSTRATE - GLASS SLIDES

LOG NUMBER - 158-PA13     ANALYST - FHB

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                                                                NUMBER COUNTED
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                                                          DIATOMS               NON-DIATOMS
TAXON CODE   TAXON                                   PROPORTIONAL COUNT   SEDGWICK-RAFTER COUNT
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  1NAVIA   NAVICULA VIRIDULA VAR. AVENACEA                   130
  1NIFRU   NITZSCHIA FRUSTULUM                               13
  1THSPP   THALASSIOSIRA FLUVIATILIS                         P
  1NASEA   NAVICULA SECRETA VAR. APICULATA                   8
  1NILIN   NITZSCHIA LINEARIS                                P
  1NIFON   NITZSCHIA FONTICOLA                               6
  1NIDIS   NITZSCHIA DISSIPATA                               8
  1FRACB   FRAGILAREA CONSTRUENS VAR. BINODIS                1
  1RHCUR   RHOICOSPHENIA CURVATA                             10
  1CYCMF   CYCLOTELLA MENEGHINIANA                           8
  1NISIE   NITZSCHIA SIGMOIDEA                               3
  1ACLAD   ACHNANTHES LANCEOLATA VAR. DUBIA                  2
  1ACMIN   ACHNANTHES MINUTISSIMA                            3
  1NILIN   NITZSCHIA LINEARIS                                2
  1NIPAC   NITZXCHIA PALEACEA                                3
  1UNPEN   UNIDENTIFIED PENNATE DIATOMS                      2
  1ACLIN   ACHNANTHES LINEARIS                               5
  1NACRV   NAVICULA CRYPTOCEPHALA VAR. VENETA                9
  1SYAMP   SYNEDRA AMPHICEPHALA                              4
  1NISPP   NITZSCHIA SP.                                     5
  1SUOVA   SURIRELLA OVATA                                   2
  1MERCC   MERIDION CIRCULARE VAR. CONSTRICTUM               P
  1SUOVL   SURIRELLA OVALIS                                  4
  1AMPER   AMPHORA PERPUSILLA                                4
  1GOOLI   GOMPHONEMA OLIVACEUM                              1
  1NIHUN   NITZSCHIA HUNGARICA                               1
  1SYULA   SYNEDRA ULNA VAR. DANICA                          P
  1CAAMP   CALONEIS AMPHISBAENA                              P
  1COCPI   COCCONEIS PLACENTULA VAR. LINEATA                 P
  1NITRL   NITZSCHIA TRYBLIONELLA VAR. LEVIDENSIS            P
  1GYSPE   GYROSIGMA SPENCERII                               P
  1SYULN   SYNEDRA ULNA                                      P
  1DIVUL   DIATOMA VULGARE                                   P
  2CHLSP   CHLAMYDOMONAS SP.                                                    2
  2COESP   COELASTRUM SP.                                                       1
  4PHSPP   PHORMIDIUM SP.                                                       2
  5EUSPP   EUGLENA SP.                                                          P
  4OSSPP   OSCILLATORIA SP.                                                     1

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SAMPLE STATION: WP02 - MIDDLE
NUMBER OF REPLICATES - 3

REPLICATE - 2
SAMPLE DATE - 06-30-82

C - I73     V - 100 ML    DF - 1;49    L - 50 MM    W - .561 MM    D - 1  MM    S - 3    A - 3750 MM2
SUBSTRATE - GLASS SLIDES

LOG NUMBER - I58-PAI4     ANALYST - FHB

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                                                       NUMBER COUNTED
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                                                                       DIATOMS              NON-DIATOMS
TAXON CODE   TAXON                                               PROPORTIONAL COUNT   SEDGWICK-RAFTER COUNT
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  1NAVIA    NAVICULA VIRIDULA VAR. AVENACEA                              114
  1NACRV    NAVICULA CRYPTOCEPHALA VAR. VENETA                            11
  1FRACB    FRAGILAREA CONSTRUENS VAR. BINODIS                            P
  1RHCUR    RHOICOSPHENIA CURVATA                                         15
  1NARHY    NAVICULA RHYNCHOCEPHALA                                       1
  1ACMIN    ACHNANTHES MINUTISSIMA                                        3
  1NISPP    NITZSCHIA SP.                                                 6
  1NILIN    NITZSCHIA LINEARIS                                            4
  1NICAP    NITZSCHIA CAPITELLATA                                         1
  1CYCME    CYCLOTELLA MENEGHINIANA                                       7
  1NIFRU    NITZSCHIA FRUSTULUM                                           17
  1NISIE    NITZSCHIA SIGMOIDEA                                           1
  1NASEA    NAVICULA SECRETA VAR. APICULATA                               11
  1SUOVA    SURIRELLA OVATA                                               3
  1UNPEN    UNIDENTIFIED PENNATE DIATOMS                                  P
  1ACLAD    ACHNANTHES LANCEOLATA VAR. DUBIA                              1
  1NIPAC    NITZXCHIA PALEACEA                                            6
  1NIDIS    NITZSCHIA DISSIPATA                                           3
  1GOPAR    GOMPHONEMA PARVULUM                                           1
  1FRACV    FRAGILARIA CONSTRUENS VAR. VENTER                             3
  1SUOVL    SURIRELLA OVALIS                                              1
  1NATSC    NAVICULA TRIPUNCTATA VAR. SCHIZONEMOIDES                      1
  1FRAVA    FRAGILARIA VAUCHERIAE                                         6
  1FRALE    FRAGILARIA LEPTOSTAURON                                       P
  1COCPI    COCCONEIS PLACENTULA VAR. LINEATA                             1
  1DITEE    DIATOMA TENUE VAR. ELONGATUM                                  1
  1NIPAL    NITZSCHIA PALEA                                               2
  1CYMLV    CYMBELLA LAEVIS                                               1
  1SYULA    SYNEDRA ULNA VAR. DANICA                                      P
  1NIHUN    NITZSCHIA HUNGARICA                                           2
  1DESPP    DENTICULA SP.                                                 2
  1PIMIC    PINNULARIA MICROSTAURON                                       P
  1COCPE    COCCONEIS PEDICULUS                                           P
  1CYMAF    CYMBELLA AFFINIS                                              P
  1DITEN    DIATOMA TENUE                                                 P
  1RHGIN    RHOPALODIA GIBBA VAR. VENTRICOSA                              P
  5PHASE    PHACUS SP.                                                                      1
  2CHLSP    CHLAMYDOMONAS SP.                                                               1
  2GRCOC    UNIDENTIFIED GREEN COCCOID                                                      1
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SAMPLE STATION: WP02 - MIDDLE
NUMBER OF REPLICATES - 3

REPLICATE - 3
SAMPLE DATE - 06-30-82

C - 243    V - 100 ML   DF - 1:49   L - 50 MM   W - .561 MM   D - 1  MM   S - 3   A - 3750 MM2
SUBSTRATE - GLASS SLIDES

LOG NUMBER - 153-PA15     ANALYST - FHB

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                                                                 NUMBER COUNTED
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                                                                    DIATOMS             NON-DIATOMS
TAXON CODE   TAXON                                          PROPORTIONAL COUNT   SEDGWICK-RAFTER COUNT
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  INAVIA   NAVICULA VIRIDULA VAR. AVENACEA                          128
  IACMIN   ACHNANTHES MINUTISSIMA                                   4
  INACRV   NAVICULA CRYPTOCEPHALA VAR. VENETA                       5
  ICYCMF   CYCLOTELLA MENEGHINIANA                                  3
  IACLAD   ACHNANTHES LANCEOLATA VAR. DUBIA                         8
  INILIN   NITZSCHIA LINEARIS                                       1
  ISUOVA   SURIRELLA OVATA                                          8
  INATSC   NAVICULA TRIPUNCTATA VAR. SCHIZONEMOIDES                 3
  INIHUN   NITZSCHIA HUNGARICA                                      3
  INISIE   NITZSCHIA SIGMOIDEA                                      P
  IFRAVA   FRAGILARIA VAUCHERIAE                                    4
  ICASPP   CALONEIS SP.                                             P
  INIPAL   NITZSCHIA PALEA                                          4
  INIFRU   NITZSCHIA FRUSTULUM                                      16
  INAMUU   NAVICULA MUTICA VAR. UNDULATA                            2
  IUNPEN   UNIDENTIFIED PENNATE DIATOMS                             2
  INIDIS   NITZSCHIA DISSIPATA                                      10
  INICAP   NITZSCHIA CAPITELLATA                                    4
  IFRALE   FRAGILARIA LEPTOSTAURON                                  2
  ICOCPI   COCCONEIS PLACENTULA VAR. LINEATA                        1
  ISUOVL   SURIRELLA OVALIS                                         2
  ICYMMS   CYMBELLA MINUTA VAR. SILESIACA                           2
  INIPAC   NITZXCHIA PALEACEA                                       2
  ISYULN   SYNEDRA ULNA                                             1
  IRHCUR   RHOICOSPHENIA CURVATA                                    4
  INASEA   NAVICULA SECRETA VAR. APICULATA                          6
  IAMPER   AMPHORA PERPUSILLA                                       2
  INIAPI   NITZSCHIA APICULATA                                      4
  INIGRA   NITZSCHIA GRACILIS                                       1
  INAPUC   NAVICULA PUPULA VAR. CAPITATA                            1
  INACRY   NAVICULA CRYPTOCEPHALA                                   1
  INIFON   NITZSCHIA FONTICOLA                                      7
  IRHMUS   RHOPALODIA MUSCULUS                                      P
  IGOOLI   GOMPHONEMA OLIVACEUM                                     P
  ISYACU   SYNEDRA ACUS                                             P
  IGYSPE   GYROSIGMA SPENCERII                                      P
  4OSTIN   OSCILLATORIA TENVIS                                                        1
  2CHLSP   CHLAMYDOMONAS SP.                                                          2
  2STITE   STIGEOCLONIUM TENUE                                                        P

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SAMPLE STATION: WP03 - HUNTER
NUMBER OF REPLICATES - 3

REPLICATE - I
SAMPLE DATE - 06-30-82

C - 601     V - 100 ML   DF - 1:49    L - 50 MM    W - .561 MM    D - 1  MM    S - 2    A - 3750 MM2
SUBSTRATE - GLASS SLIDES

LOG NUMBER - 158-PA16     ANALYST - FHB

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                                                        NUMBER COUNTED
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TAXON CODE	TAXON	DIATOMS PROPORTIONAL COUNT	NON-DIATOMS SEDGWICK-RAFTER COUNT
1NAVIA	NAVICULA VIRIDULA VAR. AVENACEA	63	
1NIFRU	NITZSCHIA FRUSTULUM	91	
1NIAPI	NITZSCHIA APICULATA	6	
1ACMIN	ACHNANTHES MINUTISSIMA	10	
1COCPI	COCCONEIS PLACENTULA VAR. LINEATA	5	
1ACLIN	ACHNANTHES LINEARIS	P	
1SUOVA	SURIRELLA OVATA	2	
1NIHUN	NITZSCHIA HUNGARICA	3	
1CYCME	CYCLOTELLA MENEGHINIANA	3	
1SUOVL	SURIRELLA OVALIS	6	
1RHCUR	RHOICOSPHENIA CURVATA	10	
1NIPAL	NITZSCHIA PALEA	16	
1NIFON	NITZSCHIA FONTICOLA	5	
1ACLAD	ACHNANTHES LANCEOLATA VAR. DUBIA	3	
1NAMUT	NAVICULA MUTICA	P	
1FRAVA	FRAGILARIA VAUCHERIAE	P	
1NISPP	NITZSCHIA SP.	P	
1RHMUS	RHOPALODIA MUSCULUS	P	
1NACRV	NAVICULA CRYPTOCEPHALA VAR. VENETA	P	
1NASEA	NAVICULA SECRETA VAR. APICULATA	19	
1COCPE	COCCONEIS PEDICULUS	1	
1THSPP	THALASSIOSIRA FLUVIATILIS	5	
1NIDIS	NITZSCHIA DISSIPATA	8	
1NALUZ	NAVICULA LUZONENSIS	1	
1NAARV	NAVICULA ARVENSIS	3	
1UNPEN	UNIDENTIFIED PENNATE DIATOMS	2	
1GOSPP	GOMPHONEMA SP.	1	
1NAHFU	NAVICULA HEUFLERI	P	
1NIPAC	NITZXCHIA PALEACEA	2	
1CYMMS	CYMBELLA MINUTA VAR. SILESIACA	2	
1GOPAR	GOMPHONEMA PARVULUM	2	
1FRALE	FRAGILARIA LEPTOSTAURON	P	
1CYMAF	CYMBELLA AFFINIS	P	
1AMPER	AMPHORA PERPUSILLA	P	
1NAPUP	NAVICULA PUPULA	P	
1NISIE	NITZSCHIA SIGMOIDEA	P	
1NITRL	NITZSCHIA TRYBLIONELLA VAR. LEVIDENSIS	P	
1NILIN	NITZSCHIA LINEARIS	P	
1SYULN	SYNEDRA ULNA	P	
1CYDSO	CYMATOPLEURA SOLEA	P	
1HANAM	HANTZSCHIA AMPHIOXYS	P	
1RHGIN	RHOPALODIA GIBBA VAR. VENTRICOSA	P	
1DIVUL	DIATOMA VULGARE	P	
1CAAMP	CALONEIS AMPHISBAENA	P	
1PIVIM	PINNULARIA VIRIDIS VAR. MINOR	P	
4OSTEN	OSCILLATORIA TENUIS		P
4OSSPP	OSCILLATORIA SP.		P

SAMPLE STATION: WP03 - HUNTER
NUMBER OF REPLICATES - 3

REPLICATE - 2
SAMPLE DATE - 06-30-82

C - 57I   V - 100 ML   DF - 1:49   L - 50 MM   W - .561 MM   D - 1 MM   S - 2   A - 3750 MM2
SUBSTRATE - GLASS SLIDES

LOG NUMBER - 158-PA17   ANALYST - EHB

TAXON CODE	TAXON	NUMBER COUNTED DIATOMS PROPORTIONAL COUNT	NUMBER COUNTED NON-DIATOMS SEDGWICK-RAFTER COUNT
1NIPAL	NITZSCHIA PALEA	2	
1NAVIA	NAVICULA VIRIDULA VAR. AVENACEA	62	
1CYCME	CYCLOTELLA MENEGHINIANA	7	
1NIDIS	NITZSCHIA DISSIPATA	8	
1NIFRU	NITZSCHIA FRUSTULUM	103	
1NIFON	NITZSCHIA FONTICOLA	13	
1SYPUC	SYNEDRA PULCHELLA	P	
1PISPP	PINNULARIA SP.	P	
1SUOVL	SURIRELLA OVALIS	11	
1NIAPI	NITZSCHIA APICULATA	15	
1ACMIN	ACHNANTHES MINUTISSIMA	18	
1NACRV	NAVICULA CRYPTOCEPHALA VAR. VENETA	6	
1SUOVA	SURIRELLA OVATA	10	
1RHCUR	RHOICOSPHENIA CURVATA	3	
1THSPP	THALASSIOSIRA FLUVIATILIS	2	
1HANAM	HANTZSCHIA AMPHIOXYS	P	
1NASEA	NAVICULA SECRETA VAR. APICULATA	10	
1SYDEL	SYNEDRA DELICATISSIMA	1	
1NILIN	NITZSCHIA LINEARIS	5	
1ACLAD	ACHNANTHES LANCEOLATA VAR. DUBIA	4	
1NAHEU	NAVICULA HEUFLERI	2	
1NIHUN	NITZSCHIA HUNGARICA	11	
1AMPER	AMPHORA PERPUSILLA	2	
1NAPRO	NAVICULA PROTRACTA	P	
1GOANG	GOMPHONEMA ANGUSTATUM	2	
1GOPAR	GOMPHONEMA PARVULUM	2	
1ACLAN	ACHNANTHES LANCEOLATA	2	
1NITPL	NITZSCHIA TRYBLIONELLA VAR. LEVIDENSIS	P	
1FRALE	FRAGILARIA LEPTOSTAURON	P	
1DIVUL	DIATOMA VULGARE	P	
1CYMAF	CYMBELLA AFFINIS	P	
1NISIE	NITZSCHIA SIGMOIDEA	P	
1RHMUS	RHOPALODIA MUSCULUS	P	
1NACUS	NAVICULA CUSPIDATA	P	
1COCPI	COCCONEIS PLACENTULA VAR. LINEATA	P	
1GYSPE	GYROSIGMA SPENCERII	P	
1SYULN	SYNEDRA ULNA	P	
1CYMMS	CYMBELLA MINUTA VAR. SILESIACA	P	
4OSTEN	OSCILLATORIA TENUIS		1
2STITE	STIGEOCLONIUM TENUE		P

SAMPLE STATION: WP03 - HUNTER CRK
NUMBER OF REPLICATES - 3

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REPLICATE - 3
SAMPLE DATE - 06-30-82

C - 467      V - 100 ML    DF - 1:49    L - 50 MM    W - .561 MM    D - 1  MM    S - 2     A - 3750 MM2
SUBSTRATE - GLASS SLIDES

LOG NUMBER - 158-PA18      ANALYST - FHB

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                                                                                NUMBER COUNTED
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                                                                      DIATOMS                 NON-DIATOMS
TAXON CODE    TAXON                                              PROPORTIONAL COUNT   SEDGWICK-RAFTER COUNT
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  1NIFRU    NITZSCHIA FRUSTULUM                                         70
  1NAVIA    NAVICULA VIRIDULA VAR. AVENACEA                             96
  1NALUZ    NAVICULA LUZONENSIS                                         2
  1NIDIS    NITZSCHIA DISSIPATA                                         P
  1RHCUR    RHOICOSPHENIA CURVATA                                       2
  1SUOVL    SURIRELLA OVALIS                                            10
  1NILIN    NITZSCHIA LINEARIS                                          5
  1NIAPI    NITZSCHIA APICULATA                                         14
  1ACLAD    ACHNANTHES LANCEOLATA VAR. DUBIA                            2
  1PISPP    PINNULARIA SP.                                              2
  1NASEA    NAVICULA SECRETA VAR. APICULATA                             6
  1ACMIN    ACHNANTHES MINUTISSIMA                                      20
  1DIVUL    DIATOMA VULGARE                                             P
  1SUOVA    SURIRELLA OVATA                                             6
  1NITRL    NITZSCHIA TRYBLIONELLA VAR. LEVIDENSIS                      2
  1NISIE    NITZSCHIA SIGMOIDEA                                         1
  1NIFON    NITZSCHIA FONTICOLA                                         7
  1NIHUN    NITZSCHIA HUNGARICA                                         4
  1RHGIN    RHOPALODIA GIBBA VAR. VENTRICOSA                            2
  1NAMIN    NAVICULA MINIMA                                             2
  1ACLAN    ACHNANTHES LANCEOLATA                                       2
  1FRAVA    FRAGILARIA VAUCHERIAE                                       1
  1NAARV    NAVICULA ARVENSIS                                           3
  1GOSUB    GOMPHONEMA SUBCLAVATUM                                      2
  1CYCME    CYCLOTELLA MENEGHINIANA                                     1
  1ACLIN    ACHNANTHES LINEARIS                                         2
  1AMOVL    AMPHORA OVALIS VAR. PEDICULUS                               P
  1THSPP    THALASSIOSIRA FLUVIATILIS                                   P
  1COCPI    COCCONEIS PLACENTULA VAR. LINEATA                           P
  1GYSPE    GYROSIGMA SPENCERII                                         P
  1CYDSO    CYMATOPLEURA SOLEA                                          P
  1SYULN    SYNEDRA ULNA                                                P
  1COCPE    COCCONEIS PEDICULUS                                         P
  4OSTEN    OSCILLATORIA TENVIS                                                              1

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PERIPHYTON BENCH SHEET

CATHEDRAL BLUFFS SHALE OIL COMPANY
PICEANCE CREEK

SAMPLE STATION: WPL1 - STEWART
NUMBER OF REPLICATES - 3

REPLICATE - 1
SAMPLE DATE - 07-29-82

C - 222   V - 100 ML   DF - 1:49   L - 50 MM   W - .561 MM   D - 1 MM   S - 2   A - 3750 MM2
SUBSTRATE - GLASS SLIDES

LOG NUMBER - 155-PA19   ANALYST - FHB

		NUMBER COUNTED	
		DIATOMS	NON-DIATOMS
TAXON CODE	TAXON	PROPORTIONAL COUNT	SEDGWICK-RAFTER COUNT
4PHSPP	PHORMIDIUM SP.		3
2OESPP	OEDOGONIUM SP.		2
2STITE	STIGEOCLONIUM TENUE		20
2TEMIN	TETRAEDRON MINIMUM		1
1RHCUR	RHOICOSPHENIA CURVATA	55	
1COCPI	COCCONEIS PLACENTULA VAR. LINEATA	27	
1SYULN	SYNEDRA ULNA	6	
1DIVUL	DIATOMA VULGARE	7	
1NAVIA	NAVICULA VIRIDULA VAR. AVENACEA	30	
1SUOVA	SURIRELLA OVATA	P	
1ACLAD	ACHNANTHES LANCEOLATA VAR. DUBIA	20	
1HANAM	HANTZSCHIA AMPHIOXYS	P	
1ACMIN	ACHNANTHES MINUTISSIMA	12	
1COCPL	COCCONEIS PLACENTULA	P	
1NIFON	NITZSCHIA FONTICOLA	12	
1CYCME	CYCLOTELLA MENEGHINIANA	4	
1NIDIS	NITZSCHIA DISSIPATA	10	
1CYMSI	CYMBELLA SINUATA	P	
1NAMIN	NAVICULA MINIMA	2	
1GOOLI	GOMPHONEMA OLIVACEUM	7	
1GOPAR	GOMPHONEMA PARVULUM	2	
1SYDEL	SYNEDRA DELICATISSIMA	13	
1NIFRU	NITZSCHIA FRUSTULUM	7	
1AMPER	AMPHORA PERPUSILLA	2	
1FRAVA	FRAGILARIA VAUCHERIAE	8	
1NACRV	NAVICULA CRYPTOCEPHALA VAR. VENETA	1	
1COCPU	COCCONEIS PLACENTULA VAR. EUGLYPTA	P	
1NILIN	NITZSCHIA LINEARIS	P	
1SYAMP	SYNEDRA AMPHICEPHALA	P	
1NIPAL	NITZSCHIA PALEA	10	
1NIHUN	NITZSCHIA HUNGARICA	P	
1FRACV	FRAGILARIA CONSTRUENS VAR. VENTER	1	
1NASEA	NAVICULA SECRETA VAR. APICULATA	P	
1NACRY	NAVICULA CRYPTOCEPHALA	2	
1COCPE	COCCONEIS PEDICULUS	1	
1NICOM	NITZSCHIA COMMUNIS	1	
1NIPAC	NITZSCHIA PALEACEA	2	
1SYACU	SYNEDRA ACUS	2	

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1NASPP   NAVICULA SP.                                          1
1UNPEN   UNIDENTIFIED PENNATE DIATOMS                          4
1NAISC   NAVICULA TRIPUNCTATA VAR. SCHIZONEMOIDES              1
1NICAP   NITZSCHIA CAPITELLATA                                 1
1NITRL   NITZSCHIA TRYBLIONELLA VAR. LEVIDENSIS                P
1NIAPI   NITZSCHIA APICULATA                                   2
1STSPP   STEPHANODISCUS SP.                                    2

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SAMPLE STATION WP01 - STEWART
NUMBER OF REPLICATES - 3

REPLICATE - 2
SAMPLE DATE - 07-29-82

C - 286     V - 100 ML   DF - 1148    L - 50 MM    W - .561 MM   D - 1  MM   S - 2    A - 3750 MM2
SUBSTRATE - GLASS SLIDES

LOG NUMBER - 15E-PA20      ANALYST - FHE

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                                                               NUMBER COUNTED
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                                                             DIATOMS              NON-DIATOMS
TAXON CODE    TAXON                                    PROPORTIONAL COUNT   SEDGWICK-RAFTER COUNT
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 1NIHUN   NITZSCHIA HUNGARICA                                  P
 1NAVIA   NAVICULA VIRIDULA VAR. AVENACEA                      56
 1DIVUL   DIATOMA VULGARE                                      6
 1RHCUR   RHOICOSPHENIA CURVATA                                60
 1ACMIN   ACHNANTHES MINUTISSIMA                               13
 1SYULN   SYNEDRA ULNA                                         16
 1COCPI   COCCONEIS PLACENTULA VAR. LINEATA                    10
 1NIDIS   NITZSCHIA DISSIPATA                                  19
 1NIPAL   NITZSCHIA PALEA                                      16
 1COCPE   COCCONEIS PEDICULUS                                  P
 1NACRV   NAVICULA CRYPTOCEPHALA VAR. VENETA                   9
 1AMPER   AMPHORA PERPUSILLA                                   P
 1ACLAD   ACHNANTHES LANCEOLATA VAR. DUBIA                     17
 1HANAM   HANTZSCHIA AMPHIOXYS                                 1
 1GOOLI   GOMPHONEMA OLIVACEUM                                 10
 1RHMUS   RHOPALODIA MUSCULUS                                  1
 1ACLIN   ACHNANTHES LINEARIS                                  2
 1CYCME   CYCLOTELLA MENEGHINIANA                              5
 1SYDEL   SYNEDRA DELICATISSIMA                                20
 1NASEA   NAVICULA SECRETA VAR. APICULATA                      10
 1GOPAR   GOMPHONEMA PARVULUM                                  2
 1NIAPI   NITZSCHIA APICULATA                                  7
 1FRAVA   FRAGILARIA VAUCHERIAE                                5
 1NISPP   NITZSCHIA SP.                                        8
 1SYAMP   SYNEDRA AMPHICEPHALA                                 4
 1NIFRU   NITZSCHIA FRUSTULUM                                  1
 1THSPP   THALASSIOSIRA FLUVIATILIS                            4
 1NIFON   NITZSCHIA FONTICOLA                                  2
 1NIPAC   NITZXCHIA PALEACEA                                   2
 1NISIE   NITZSCHIA SIGMOIDEA                                  P
 1NICAP   NITZSCHIA CAPITELLATA                                2
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1CAAMP   CALONEIS AMPHISBAENA                             P
1GOSUB   GOMPHONEMA SUBCLAVATUM                           P
1CYMMS   CYMBELLA MINUTA VAR. SILESIACA                   P
1CYOSO   CYMATOPLEURA SOLEA                               P
1SUOVA   SURIRELLA OVATA                                  P
1AMPER   AMPHORA PERPUSILLA                               P
1CYMAF   CYMBELLA AFFINIS                                 P
2STITE   STIGEOCLONIUM TENUE                                         27
2MOUSP   MOUGEOTIA SP.                                               2
5PHASP   PHACUS SP.                                                  1
4LYNSP   LYNGBYA SP.                                                 2

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SAMPLE STATION NP01 - STEWART
NUMBER OF REPLICATES - 3

REPLICATE - 3
SAMPLE DATE - 07-29-82

C - 252     V - 100 ML    DF - 1148    L - 50 MM    W - .561 MM    D - 1 MM    S - 2    A - 3750 MM2
SUBSTRATE - GLASS SLIDES

LOG NUMBER - 156-PA21      ANALYST - FHB

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                                                                  NUMBER COUNTED
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                                                          DIATOMS             NON-DIATOMS
TAXON CODE   TAXON                                   PROPORTIONAL COUNT   SEDGWICK-RAFTER COUNT
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  1SYULN   SYNEDRA ULNA                                      12
  1COCPI   COCCONEIS PLACENTULA VAR. LINEATA                 13
  1RHCUR   RHOICOSPHENIA CURVATA                             53
  1GOPAR   GOMPHONEMA PARVULUM                               P
  1NAVIA   NAVICULA VIRIDULA VAR. AVENACEA                   29
  1SYDEL   SYNEDRA DELICATISSIMA                             9
  1GOOLI   GOMPHONEMA OLIVACEUM                              5
  1NASEA   NAVICULA SECRETA VAR. APICULATA                   5
  1CYCME   CYCLOTELLA MENEGHINIANA                           2
  1DIVUL   DIATOMA VULGARE                                   3
  1NACRY   NAVICULA CRYPTOCEPHALA                            P
  1NACRV   NAVICULA CRYPTOCEPHALA VAR. VENETA                17
  1ACMIN   ACHNANTHES MINUTISSIMA                            10
  1CYMSI   CYMBELLA SINUATA                                  2
  1NIFRU   NITZSCHIA FRUSTULUM                               5
  1NIPAC   NITZXCHIA PALEACEA                                2
  1ACLAD   ACHNANTHES LANCEOLATA VAR. DUBIA                  4
  1NIPAL   NITZSCHIA PALEA                                   5
  1NIAPI   NITZSCHIA APICULATA                               1
  1NANOT   NAVICULA NOTHA                                    2
  1NIDIS   NITZSCHIA DISSIPATA                               5
  1NAMIN   NAVICULA MINIMA                                   2
  1NIFON   NITZSCHIA FONTICOLA                               13
  1SUOVA   SURIRELLA OVATA                                   1
  1FRAVA   FRAGILARIA VAUCHERIAE                             6
  1NICAP   NITZSCHIA CAPITELLATA                             3
  1NATSC   NAVICULA TRIPUNCTATA VAR. SCHIZONEMOIDES          2
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1NISPP   NITZSCHIA SP.                              3
1AMPER   AMPHORA PERPUSILLA                         5
1FRACB   FRAGILAREA CONSTRUENS VAR. BINODIS         3
1NIHUN   NITZSCHIA HUNGARICA                        1
1SYACU   SYNEDRA ACUS                               3
1NISIG   NITZSCHIA SIGMOIDEA                        2
1THSPF   THALASSIOSIRA FLUVIATILIS                  1
1ACLIN   ACHNANTHES LINEARIS                        2
1COCPE   COCCONEIS PEDICULUS                        P
1GOSUB   GOMPHONEMA SUBCLAVATUM                     P
1CAVEM   CALONEIS VENTRICOSA VAR. MINUTA            P
2STITE   STIGEOCLONIUM TENUE                                        17
2MOUSP   MOUGEOTIA SP.                                               7
4OSTEN   OSCILLATORIA TENUIS                                         1
2CHLSP   CHLAMYDOMONAS SP.                                           3
4ANASP   ANABAENA SP.                                                1
4OSSPP   OSCILLATORIA SP.                                            2

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SAMPLE STATION: WPO2 - MIDDLE
NUMBER OF REPLICATES - 3

REPLICATE - 3
SAMPLE DATE - 07-29-82

C - 132     V - 100 ML    DF - 1:49    L - 50 MM    W - .56  MM    D - 1  MM    S - 2     A - 3750 MM2
SUBSTRATE - GLASS SLIDES

LOG NUMBER - 158-PA22      ANALYST - FHM

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                                                            NUMBER COUNTED
                                                            --------------

                                                       DIATOMS            NON-DIATOMS
TAXON CODE   TAXON                               PROPORTIONAL COUNT   SEDGWICK-RAFTER COUNT
--------------------------------------------------------------------------------

  1RHCUR   RHOICOSPHENIA CURVATA                         48
  1NAVIA   NAVICULA VIRIDULA VAR. AVENACEA               61
  1NANOT   NAVICULA NOTHA                                 2
  1FRAVA   FRAGILARIA VAUCHERIAE                          7
  1SYDEL   SYNEDRA DELICATISSIMA                         15
  1NAMIN   NAVICULA MINIMA                                4
  1NICAP   NITZSCHIA CAPITELLATA                          2
  1NISPP   NITZSCHIA SP.                                  5
  1NIPAL   NITZSCHIA PALEA                                5
  1NICOM   NITZSCHIA COMMUNIS                             2
  1SYULN   SYNEDRA ULNA                                   7
  1NACRV   NAVICULA CRYPTOCEPHALA VAR. VENETA            15
  1ACMIN   ACHNANTHES MINUTISSIMA                         4
  1AMPEP   AMPHORA PERPUSILLA                             4
  1NIDIS   NITZSCHIA DISSIPATA                           22
  1CYMEN   CYCLOTELLA MENEGHINIANA                        6
  1GOOLI   GOMPHONEMA OLIVACEUM                           5
  1ACLAD   ACHNANTHES LANCEOLATA VAR. DUBIA              12
  1SUOVA   SURIRELLA OVATA                                1
  1NIFON   NITZSCHIA FONTICOLA                           14
  1COPLI   COCCONEIS PLACENTULA VAR. LINEATA             17
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1CYMMS   CYMBELLA MINUTA VAR. SILESIACA                        1
1DIVUL   DIATOMA VULGARE                                       7
1NISIG   NITZSCHIA SIGMOIDEA                                   P
1NASEA   NAVICULA SECRETA VAR. APICULATA                       4
1HAMAM   HANTZSCHIA AMPHIOXYS                                  2
1GOPAR   GOMPHONEMA PARVULUM                                   3
1NIFRU   NITZSCHIA FRUSTULUM                                   1
1ACLAN   ACHNANTHES LANCEOLATA                                 1
1RHMUS   RHOPALODIA MUSCULUS                                   2
1NATSC   NAVICULA TRIPUNCTATA VAR. SCHIZONEMOIDES              2
1ACLIN   ACHNANTHES LINEARIS                                   2
1NIPAL   NITZXCHIA PALEACEA                                    1
1NACRY   NAVICULA CRYPTOCEPHALA                                P
1NITRL   NITZSCHIA TRYBLIONELLA VAR. LEVIDENSIS                P
2TRSPP   TRACHELOMONAS SP.                                                 1
2STITE   STIGEOCLONIUM TENUE                                               29
2CHLSP   CHLAMYDOMONAS SP.                                                 2
2MOLSP   MOUGEOTIA SP.                                                     2
2ANKSP   ANKISTRODESMUS SP.                                                2
4OSSPP   OSCILLATORIA SP.                                                  1

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SAMPLE STATION: WPC2 - MIDDLE
NUMBER OF REPLICATES - 3

REPLICATE - 2
SAMPLE DATE - 07-29-82

C - 116      V - 100 ML    DF - 1:49    L - 50 MM    W - .561 MM   D - 1  MM    S - 2    A - 3750 MM2
SUBSTRATE - GLASS SLIDES

LOG NUMBER - 15M-PA23      ANALYST - MHB

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                                                            NUMBER COUNTED
                                                            --------------

                                                       DIATOMS             NON-DIATOMS
TAXON CODE   TAXON                                PROPORTIONAL COUNT  SEDGWICK-RAFTER COUNT
------------------------------------------------------------------------------------


  1GOPAR   GOMPHONEMA PARVULUM                                 22
  1COCPI   COCCONEIS PLACENTULA VAR. LINEATA                   19
  1ACLAL   ACHNANTHES LANCEOLATA VAR. DUBIA                    40
  1RHCUR   RHOICOSPHENIA CURVATA                               50
  1SYULN   SYNEDRA ULNA                                        7
  1NACUS   NAVICULA CUSPIDATA                                  P
  1NAVIA   NAVICULA VIRIDULA VAR. AVENACEA                     25
  1NACRV   NAVICULA CRYPTOCEPHALA VAR. VENETA                  7
  1ACMIN   ACHNANTHES MINUTISSIMA                              23
  1CYCME   CYCLOTELLA MENEGHINIANA                             5
  1NICOM   NITZSCHIA COMMUNIS                                  2
  1NIPAL   NITZSCHIA PALEA                                     6
  1THSPP   THALASSIOSIRA FLUVIATILIS                           1
  1SYDEL   SYNEDRA DELICATISSIMA                               6
  1NIFON   NITZSCHIA FONTICOLA                                 19
  1SUOVA   SURIRELLA OVATA                                     2
  1GOOLI   GOMPHONEMA OLIVACEUM                                15
  1FRAVA   FRAGILARIA VAUCHERIAE                               16
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 1          BACILLARIOPHYTA                                    2
 1NIPAL     NITZSCHIA PALEACEA                                 2
 1AMVEN     AMPHORA VENETA                                     P
 1UNPEN     UNIDENTIFIED PENNATE DIATOMS                       4
 1NIFRU     NITZSCHIA FRUSTULUM                                10
 1CASPP     CALONEIS SP.                                       2
 1CYMSI     CYMBELLA SINUATA                                   2
 1NIDIS     NITZSCHIA DISSIPATA                                5
 1NAMIN     NAVICULA MINIMA                                    1
 1NAVIR     NAVICULA VIRIDULA                                  P
 1NACRY     NAVICULA CRYPTOCEPHALA                             P
 2CHLSP     CHLAMYDOMONAS SP.                                                2
 5TRSPP     TRACHELOMONAS SP.                                                P
 2STITE     STIGEOCLONIUM TENUE                                              29
 2MOUSP     MOUGEOTIA SP.                                                    2
 4PHSPP     PHORMIDIUM SP.                                                   1
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SAMPLE STATION: RP02 - MIDDLE
NUMBER OF REPLICATES - 3

REPLICATE - 3
SAMPLE DATE - 07-29-82

C - 3E       V - 100 ML   DF = 1:4F    L = 50 MM   W = .561 MM   D = 1 MM   S = 2   A = 3750 MM2
SUBSTRATE - GLASS SLIDES

LOC NUMBER - 15E-PA24       ANALYST - FHB

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                                                          NUMBER COUNTED
                                                          --------------

                                                    DIATOMS           NON-DIATOMS
TAXON CODE   TAXON                            PROPORTIONAL COUNT   SEDGWICK-RAFTER COUNT
-----------------------------------------------------------------------------------

  1GOOLI    GOMPHONEMA OLIVACEUM                              8
  1SYULN    SYNEDRA ULNA                                      3
  1NACRV    NAVICULA CRYPTOCEPHALA VAR. VENETA                5
  1GOPAR    GOMPHONEMA PARVULUM                               21
  1COCPL    COCCONEIS PLACENTULA VAR. LINEATA                 21
  1NAVIA    NAVICULA VIRIDULA VAR. AVENACEA                   17
  1ACLAD    ACHNANTHES LANCEOLATA VAR. DUBIA                  26
  1FRAVA    FRAGILARIA VAUCHERIAE                             4
  1AMPER    AMPHORA PERPUSILLA                                3
  1RHCUR    RHOICOSPHENIA CURVATA                             57
  1NIDIS    NITZSCHIA DISSIPATA                               9
  1NASEA    NAVICULA SECRETA VAR. APICULATA                   6
  1ACMIN    ACHNANTHES MINUTISSIMA                            13
  1UNPEN    UNIDENTIFIED PENNATE DIATOMS                      7
  1NIPAL    NITZSCHIA PALEACEA                                4
  1NIFRU    NITZSCHIA FRUSTULUM                               9
  1NIFON    NITZSCHIA FONTICOLA                               7
  1SYDEL    SYNEDRA DELICATISSIMA                             P
  1GOSUB    GOMPHONEMA SUBCLAVATUM                            3
  1NILIN    NITZSCHIA LINEARIS                                1
  1SUOVA    SURIRELLA OVATA                                   1
  1NIPAL    NITZSCHIA PALEA                                   6
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1NANOT   NAVICULA NOTHA                                   1
1SYFAT   SYNEDRA FASCICULATA VAR. TRUNCATA                1
1FRACB   FRAGILAREA CONSTRUENS VAR. BINODIS               6
1NAMIN   NAVICULA MINIMA                                  2
1CYCME   CYCLOTELLA MENEGHINIANA                          3
1ACLIN   ACHNANTHES LINEARIS                              2
1NIAPI   NITZSCHIA APICULATA                              3
1NISIG   NITZSCHIA SIGMOIDEA                              P
1DIVUL   DIATOMA VULGARE                                  P
2STITE   STIGEOCLONIUM TENUE                                         17
5TRSPP   TRACHELOMONAS SP.                                           2
2ANKSP   ANKISTRODESMUS SP.                                          1
4ANASP   ANABAENA SP.                                                P
2CHLSP   CHLAMYDOMONAS SP.                                           F
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PERIPHYTON BENCH SHEET
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CATHEDRAL BLUFFS SHALE OIL COMPANY
PICEANCE CREEK

SAMPLE STATION: #P01 - STEWART
NUMBER OF REPLICATES - 3

REPLICATE - 1
SAMPLE DATE - 09-02-82

C - 418     V - 100 ML    DF - 1:49    L - 50 MM    W - .561 MM    D - 1  MM    S - 2    A - 3750 MM2
SUBSTRATE - GLASS SLIDES

LOG NUMBER - 159-PA25      ANALYST - FBB
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                                                                       NUMBER COUNTED
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                                                                DIATOMS              NON-DIATOMS
TAXON CODE   TAXON                                         PROPORTIONAL COUNT   SEDGWICK-RAFTER COUNT
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  1CYCME    CYCLOTELLA MENEGHINIANA                                P
  1NIDIS    NITZSCHIA DISSIPATA                                    82
  1RHCUR    RHOICOSPHENIA CURVATA                                  35
  1NAVIA    NAVICULA VIRIDULA VAR. AVENACEA                        100
  1GOOLI    GOMPHONEMA OLIVACEUM                                   8
  1NACRV    NAVICULA CRYPTOCEPHALA VAR. VENETA                     38
  1CYMMS    CYMBELLA MINUTA VAR. SILESIACA                         4
  1COCPL    COCCONEIS PLACENTULA VAR. LINEATA                      4
  1AMPER    AMPHORA PERPUSILLA                                     7
  1SYPUC    SYNEDRA PULCHELLA                                      P
  1GOPAR    GOMPHONEMA PARVULUM                                    8
  1NIAPI    NITZSCHIA APICULATA                                    3
  1NIHUN    NITZSCHIA HUNGARICA                                    3
  1NIFON    NITZSCHIA FONTICOLA                                    22
  1ACMIN    ACHNANTHES MINUTISSIMA                                 23
  1NAHEU    NAVICULA HEUFLERI                                      22
  1NASEA    NAVICULA SECRETA VAR. APICULATA                        25
  1SYFAT    SYNEDRA FASCICULATA VAR. TRUNCATA                      P
  1NAPEL    NAVICULA PELLICULOSA                                   2
  1NASAI    NAVICULA SALINARUM VAR. INTERMEDIA                     2
  1NIFRU    NITZSCHIA FRUSTULUM                                    29
  1NIPAL    NITZSCHIA PALEA                                        3
  1FRAVA    FRAGILARIA VAUCHERIAE                                  4
  1NISPP    NITZSCHIA SP.                                          5
  1CYMAF    CYMBELLA AFFINIS                                       2
  1SUOVA    SURIRELLA OVATA                                        1
  1NAARV    NAVICULA ARVENSIS                                      4
  1ACLAD    ACHNANTHES LANCEOLATA VAR. DUBIA                       3
  1UNPEN    UNIDENTIFIED PENNATE DIATOMS                           4
  1ACLIN    ACHNANTHES LINEARIS                                    3
  1NAMUT    NAVICULA MUTICA                                        2
  1GOSPP    GOMPHONEMA SP.                                         2
  1NACRY    NAVICULA CRYPTOCEPHALA                                 1
  1SYMIN    SYNEDRA MINUSCULA                                      2
  1NISIG    NITZSCHIA SIGMOIDEA                                    P
  1SYULN    SYNEDRA ULNA                                           P
  5STTEN    STIGEOCLONIUM TENUE                                                        8
  4LYNSP    LYNGBYA SP.                                                                11
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 4CHRSP   CHROOCOCCUS SP.                                                     2
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SAMPLE STATION: SPOL - STEWART
NUMBER OF REPLICATES - 3

REPLICATE - 2
SAMPLE DATE - 09-02-82

C - 697      V - 100 ML   DF - 1:49    L - 50 MM    W - .561 MM   D - 1  MM   S - 2    A - 3750 MM2
SUBSTRATE - GLASS SLIDES

LOG NUMBER - 159-PA26      ANALYST - FHB

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                                                             NUMBER COUNTED
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                                                          DIATOMS            NON-DIATOMS
TAXON CODE   TAXON                                 PROPORTIONAL COUNT   SEDGWICK-RAFTER COUNT
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  1NIFRU   NITZSCHIA FRUSTULUM                                71
  1RHCUR   RHOICOSPHENIA CURVATA                              31
  1NAVIA   NAVICULA VIRIDULA VAR. AVENACEA                    100
  1NAHEU   NAVICULA HEUFLERI                                  25
  1NACRY   NAVICULA CRYPTOCEPHALA                             16
  1NIDIS   NITZSCHIA DISSIPATA                                77
  1NACRV   NAVICULA CRYPTOCEPHALA VAR. VENETA                 56
  1NISPP   NITZSCHIA SP.                                      2
  1ACMIN   ACHNANTHES MINUTISSIMA                             32
  1NIPAL   NITZSCHIA PALEA                                    12
  1NASEA   NAVICULA SECRETA VAR. APICULATA                    18
  1GOOLI   GOMPHONEMA OLIVACEUM                               13
  1SYFAS   SYNEDRA FASCICULATA                                P
  1COCPL   COCCONEIS PLACENTULA VAR. LINEATA                  9
  1NIFON   NITZSCHIA FONTICOLA                                16
  1GOPAR   GOMPHONEMA PARVULUM                                5
  1ACLAD   ACHNANTHES LANCEOLATA VAR. DUBIA                   3
  1NIAPI   NITZSCHIA APICULATA                                3
  1FRAVA   FRAGILARIA VAUCHERIAE                              3
  1NAARV   NAVICULA ARVENSIS                                  2
  1CYCME   CYCLOTELLA MENEGHINIANA                            3
  1CYMMU   CYMBELLA MUELLERI                                  P
  1CYMAF   CYMBELLA AFFINIS                                   4
  1NIAMP   NITZXCHIA AMPHIBIA                                 1
  1UNPEN   UNIDENTIFIED PENNATE DIATOMS                       5
  1ACLIN   ACHNANTHES LINEARIS                                4
  1NAMIN   NAVICULA MINIMA                                    3
  1NIIGN   NITZSCHIA IGNORATA                                 1
  1GOSPP   GOMPHONEMA SP.                                     1
  1NATSC   NAVICULA TRIPUNCTATA VAR. SCHIZONEMOIDES           2
  1CYMMS   CYMBELLA MINUTA VAR. SILESIACA                     1
  1SUOVA   SURIRELLA OVATA                                    1
  1AMPER   AMPHORA PERPUSILLA                                 3
  1SYULN   SYNEDRA ULNA                                       P
  1CYMAS   CYMBELLA ASPERA                                    P
  1HANAM   HANTZSCHIA AMPHIOXYS                               P
  1SUOVL   SURIRELLA OVALIS                                   P
  2STITE    STIGEOCLONIUM TENUE                                                   33
  4LYNSP    LYNGBYA SP.                                                           11
  2UNFIL    UNIDENTIFIED FILAMENT                                                  1
  2MOUSP    MOUGEOTIA SP.                                                          P
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SAMPLE STATION: WP01 - STEWART
NUMBER OF REPLICATES - 3

REPLICATE - 2
SAMPLE DATE - 09-02-82

C - 44     V - 100 ML   DF - 1:49    L - 50 MM   W - .561 MM   D - 1  MM   S - 2   A - 3750 MM2
SUBSTRATE - GLASS SLIDES

LOG NUMBER - 154-PA27     ANALYST - FHB
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                                                               NUMBER COUNTED
                                                               --------------
                                                       DIATOMS               NON-DIATOMS
TAXON CODE   TAXON                               PROPORTIONAL COUNT   SEDGWICK-RAFTER COUNT
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  1NIFRU   NITZSCHIA FRUSTULUM                             41
  1NACRV   NAVICULA CRYPTOCEPHALA VAR. VENETA              18
  1AMPER   AMPHORA PERPUSILLA                              13
  1GOOLI   GOMPHONEMA OLIVACEUM                             9
  1NAVIA   NAVICULA VIRIDULA VAR. AVENACEA                100
  1ACLAD   ACHNANTHES LANCEOLATA VAR. DUBIA                 1
  1NIDIS   NITZSCHIA DISSIPATA                             39
  1NIFON   NITZSCHIA FONTICOLA                              3
  1NASEA   NAVICULA SECRETA VAR. APICULATA                  6
  1NAHEU   NAVICULA HEUFLERI                                7
  1COCPU   COCCONEIS PLACENTULA VAR. EUGLYPTA               P
  1COCPI   COCCONEIS PLACENTULA VAR. LINEATA                6
  1RHCUR   RHOICOSPHENIA CURVATA                           17
  1SUOVA   SURIRELLA OVATA                                  P
  1ACMIN   ACHNANTHES MINUTISSIMA                          17
  1NAARV   NAVICULA ARVENSIS                                6
  1NIPAL   NITZSCHIA PALEA                                  1
  1ACLIN   ACHNANTHES LINEARIS                              5
  1FRAVA   FRAGILARIA VAUCHERIAE                            8
  1NIPAL   NITZSCHIA PALEA                                  1
  1NAMIN   NAVICULA MINIMA                                  5
  1GOTEN   GOMPHONEMA TENELLUM                              1
  1NISPP   NITZSCHIA SP.                                    P
  1NIAPI   NITZSCHIA APICULATA                              1
  1CYMSI   CYMBELLA SINUATA                                 2
  1CYCME   CYCLOTELLA MENEGHINIANA                          1
  1COCPE   COCCONEIS PEDICULUS                              1
  1NIDEN   NITZSCHIA DENTICULA                              1
  1SYACU   SYNEDRA ACUS                                     1
  1SYULN   SYNEDRA ULNA                                     1
  1SYPUC   SYNEDRA PULCHELLA                                P
  1SUOVL   SURIRELLA OVALIS                                 P
  1DIVUL   DIATOMA VULGARE                                  P
  1CYMAF   CYMBELLA AFFINIS                                 P
  1HAHAM    HANTZSCHIA AMPHIOXYS                                  P
  1CYMIS    CYMBELLA MINUTA VAR. SILESIACA                        P
  1NATSC    NAVICULA TRIPUNCTATA VAR. SCHIZONEMOIDES              P
  2STITE    STIGEOCLONIUM TENUE                                                  37
  4ANASP    ANABAENA SP.                                                         P
  4LYNSP    LYNGBYA SP.                                                          13
  4PHSPP    PHORMIDIUM SP.                                                       1
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SAMPLE STATION: WP02 - MIDDLE
NUMBER OF REPLICATES - 3

REPLICATE - 1
SAMPLE DATE - 09-02-92

C - 221     V - 100 ML   OF - 1:49    L - 50 MM   W - .561 MM   D - 1  MM   S - 2    A - 3750 MM2
SUBSTRATE - GLASS SLIDES

LOG NUMBER - 158-PA28     ANALYST - FHB

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                                                                NUMBER COUNTED
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                                                            DIATOMS            NON-DIATOMS
TAXON CODE   TAXON                                    PROPORTIONAL COUNT   SEDGWICK-RAFTER COUNT
------------------------------------------------------------------------------------------

  1NAHEU    NAVICULA HEUFLERI                                     23
  1NIFRU    NITZSCHIA FRUSTULUM                                   32
  1ACMIN    ACHNANTHES MINUTISSIMA                                14
  1NAVIA    NAVICULA VIRIDULA VAR. AVENACEA                       100
  1COCPL    COCCONEIS PLACENTULA VAR. LINEATA                     11
  1DITEE    DIATOMA TENUE VAR. ELONGATUM                          P
  1ACLAD    ACHNANTHES LANCEOLATA VAR. DUBIA                      7
  1NACRV    NAVICULA CRYPTOCEPHALA VAR. VENETA                    30
  1GOOLI    GOMPHONEMA OLIVACEUM                                  7
  1NIPAL    NITZSCHIA PALEA                                       5
  1AMPER    AMPHORA PERPUSILLA                                    15
  1RHCUR    RHOICOSPHENIA CURVATA                                 26
  1SYMIN    SYNEDRA MINUSCULA                                     12
  1NAARV    NAVICULA ARVENSIS                                     2
  1HAHAM    HANTZSCHIA AMPHIOXYS                                  P
  1ACLIN    ACHNANTHES LINEARIS                                   2
  1NASPP    NAVICULA SP.                                          2
  1NASAI    NAVICULA SALINARUM VAR. INTERMEDIA                    6
  1SUOVA    SURIRELLA OVATA                                       2
  1DIVUL    DIATOMA VULGARE                                       P
  1NIDIS    NITZSCHIA DISSIPATA                                   12
  1SYDLI    SYNEDRA DELICATISSIMA                                 1
  1NASEA    NAVICULA SECRETA VAR. APICULATA                       8
  1NIFON    NITZSCHIA FONTICOLA                                   5
  1SUOVL    SURIRELLA OVALIS                                      P
  1NATSC    NAVICULA TRIPUNCTATA VAR. SCHIZONEMOIDES              P
  1FRAVA    FRAGILARIA VAUCHERIAE                                 10
  1GOSPP    GOMPHONEMA SP.                                        1
  1UNPEN    UNIDENTIFIED PENNATE DIATOMS                          1
  1NIAPI    NITZSCHIA APICULATA                                   2
  1SYFAS    SYNEDRA FASCICULATA                                   1
  1THSPP    THALASSIOSIRA FLUVIATILIS                              1
  1CYMSI    CYMBELLA SINUATA                                       1
  1AMOVA    AMPHORA OVALIS                                         2
  1CYCME    CYCLOTELLA MENEGHINIANA                                1
  1SYSPP    SYNEDRA SP.                                            1
  1NAPUP    NAVICULA PUPULA                                        P
  1NITRL    NITZSCHIA TRYBLIONELLA VAR. LEVIDENSIS                 1
  1CYMMS    CYMBELLA MINUTA VAR. SILESIACA                         P
  1SYPUC    SYNEDRA PULCHELLA                                      P
  1GYSPE    GYROSIGMA SPENCIRII                                    P
  4MESPP    MERISMOPEDIA SP.                                                   P
  4ANASP    ANABAENA SP.                                                       P
  2STITE    STIGEOCLONIUM TENUE                                                1
  2CLOSP    CLOSTERIUM SP.                                                     P
  4LYNSP    LYNGBYA SP.                                                        1
  4OSTEN    OSCILLATORIA TENUIS                                                1

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SAMPLE STATION: WP02 - MIDDLE
NUMBER OF REPLICATES - 3

REPLICATE - 2
SAMPLE DATE - 07-02-82

C - 408     V - 100 ML   DF - 1:49    L - 50 MM    W - .561 MM    D - 1  MM    S - 2    A - 3750 MM2
SUBSTRATE - GLASS SLIDES

LOG NUMBER - 153-PA29      ANALYST - FHB

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                                                              NUMBER COUNTED
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                                                           DIATOMS              NON-DIATOMS
TAXON CODE    TAXON                                   PROPORTIONAL COUNT   SEDGWICK-RAFTER COUNT
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  1SYDEL    SYNEDRA DELICATISSIMA                                  P
  1ACMIN    ACHNANTHES MINUTISSIMA                                 25
  1NAARV    NAVICULA ARVENSIS                                      4
  1NAHEU    NAVICULA HEUFLERI                                      27
  1SYULN    SYNEDRA ULNA                                           P
  1NAVIA    NAVICULA VIRIDULA VAR. AVENACEA                        100
  1NIFRU    NITZSCHIA FRUSTULUM                                    28
  1NIDIS    NITZSCHIA DISSIPATA                                    25
  1NACRV    NAVICULA CRYPTOCEPHALA VAR. VENETA                     38
  1NASEA    NAVICULA SECRETA VAR. APICULATA                        12
  1DITIE    DIATOMA TENUE VAR. ELONGATUM                           2
  1ACLAD    ACHNANTHES LANCEOLATA VAR. DUBIA                       2
  1RHCUR    RHOICOSPHENIA CURVATA                                  29
  1GOPAR    GOMPHONEMA PARVULUM                                    5
  1NASAI    NAVICULA SALINARUM VAR. INTERMEDIA                     2
  1CYMCY    CYMBELLA CYMBIFORMIS                                   2
  1FRAVA    FRAGILARIA VAUCHERIAE                                  3
  1AMPER    AMPHORA PERPUSILLA                                     13
  1SYMIN    SYNEDRA MINUSCULA                                      2
  1SYRUF    SYNEDRA RUMPENS VAR. FAMILIARIS                        P
  1SYPUC    SYNEDRA PULCHELLA                                      P
  1COCPU    COCCONEIS PLACENTULA VAR. EUGLYPTA                     2
  1COCPI   COCCONEIS PLACENTULA VAR. LINEATA                     14
  1NIPAL   NITZSCHIA PALEA                                       3
  1NACRY   NAVICULA CRYPTOCEPHALA                                P
  1SUOVA   SURIRELLA OVATA                                       5
  1COCPE   COCCONEIS PEDICULUS                                   P
  1CYMSI   CYMBELLA SINUATA                                      5
  1AMOVF   AMPHORA OVALIS VAR. AFFINIS                           2
  1NIPAL   NITZSCHIA PALEA                                       1
  1NAMIN   NAVICULA MINIMA                                       7
  1NATSC   NAVICULA TRIPUNCTATA VAR. SCHIZONEMOIDES              2
  1NIAPI   NITZSCHIA APICULATA                                   4
  1UNPEN   UNIDENTIFIED PENNATE DIATOMS                          3
  1CYCME   CYCLOTELLA MENEGHINIANA                               2
  1DIVUL   DIATOMA VULGARE                                       P
  1ACLIN   ACHNANTHES LINEARIS                                   2
  1NASPP   NAVICULA SP.                                          1
  1SYFAS   SYNEDRA FASCICULATA                                   1
  1NIFON   NITZSCHIA FONTICOLA                                   1
  1NISPP   NITZSCHIA SP.                                         2
  1GOOLI   GOMPHONEMA OLIVACEUM                                  3
  1CYMAF   CYMBELLA AFFINIS                                      1
  1NAMUU   NAVICULA MUTICA VAR. UNDULATA                         2
  1CYMMS   CYMBELLA MINUTA VAR. SILESIACA                        1
  1FRALI   FRAGILARIA LEPTOSTAURON                               1
  1PIBRE   PINNULARIA BREBISSONII                                P
  1NACUS   NAVICULA CUSPIDATA                                    P
  1COCPE   COCCONEIS PEDICULUS                                   P
  1HANAM   HANTZSCHIA AMPHIOXYS                                  P
  2STITE   STIGEOCLONIUM TENUE                                                       4
  4LYNSP   LYNGBYA SP.                                                               P
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SAMPLE STATION: WP02 - MIDDLE
NUMBER OF REPLICATES - 3

REPLICATE - 3
SAMPLE DATE - 09-02-82

C - 433     V - 100 ML    DF - 1:49    L - 50 MM    W - .561 MM    D - 1  MM    S - 2    A - 3750 MM2
SUBSTRATE - GLASS SLIDES

LOG NUMBER - 159-PA30      ANALYST - FHB
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                                                        NUMBER COUNTED
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                                                         DIATOMS             NON-DIATOMS
TAXON CODE    TAXON                                PROPORTIONAL COUNT   SEDGWICK-RAFTER COUNT
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  1NAVIA   NAVICULA VIRIDULA VAR. AVENACEA                       101
  1NAARV   NAVICULA ARVENSIS                                     2
  1SUOVA   SURIRELLA OVATA                                       2
  1NACRV   NAVICULA CRYPTOCEPHALA VAR. VENETA                    15
  1ACMIN   ACHNANTHES MINUTISSIMA                                11
  1SYDEL   SYNEDRA DELICATISSIMA                                 1
  1AMPEP   AMPHORA PERPUSILLA                                    4
  1NIDIS   NITZSCHIA DISSIPATA                                   16
  1NIFRU   NITZSCHIA FRUSTULUM                                  25
  1NAHEU   NAVICULA HEUFLERI                                    23
  1NASAI   NAVICULA SALINARUM VAR. INTERMEDIA                   3
  1RHCUR   RHOICOSPHENIA CURVATA                                31
  1COCPI   COCCONEIS PLACENTULA VAR. LINEATA                    12
  1NIFON   NITZSCHIA FONTICOLA                                  2
  1CYCME   CYCLOTELLA MENEGHINIANA                              2
  1FRAVA   FRAGILARIA VAUCHERIAE                                2
  1NIPAL   NITZSCHIA PALEA                                      3
  1CYMSI   CYMBELLA SINUATA                                     1
  1GOPAR   GOMPHONEMA PARVULUM                                  3
  1NASEA   NAVICULA SECRETA VAR. APICULATA                      4
  1GOOLI   GOMPHONEMA OLIVACEUM                                 1
  1ACLAD   ACHNANTHES LANCEOLATA VAR. DUBIA                     2
  1NANOT   NAVICULA NOTHA                                       2
  1SYFAS   SYNEDRA FASCICULATA                                  P
  1SYULN   SYNEDRA ULNA                                         P
  1CYMAF   CYMBELLA AFFINIS                                     4
  1DIVUL   DIATOMA VULGARE                                      P
  1DITEE   DIATOMA TENUE VAR. ELONGATUM                         3
  1NIAPI   NITZSCHIA APICULATA                                  1
  1HANAM   HANTZSCHIA AMPHIOXYS                                 P
  1CYMMS   CYMBELLA MINUTA VAR. SILESIACA                       P
  1NIAMP   NITZXCHIA AMPHIBIA                                   P
  1NARHY   NAVICULA RHYNCHOCEPHALA                              P
  1AMOVF   AMPHORA OVALIS VAR. AFFINIS                          P
  1NAMUT   NAVICULA MUTICA                                      P
  1SYPUC   SYNEDRA PULCHELLA                                    P
  1GOSUB   GOMPHONEMA SUBCLAVATUM                               P
  2STITE   STIGEOCLONIUM TENUE                                                   6
  4LYNSP   LYNGBYA SP.                                                           2

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SAMPLE STATION: WP03 - HUNTER
NUMBER OF REPLICATES - 3

REPLICATE - 1
SAMPLE DATE - 09-02-82

C - 106     V - 100 ML   DF - 1:49   L - 50 MM   W - .561 MM   D - 1 MM   S - 6   A - 3750 MM2
SUBSTRATE - GLASS SLIDES

LOG NUMBER - 158-PA31     ANALYST - FHB

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                                                              NUMBER COUNTED
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                                                        DIATOMS            NON-DIATOMS
TAXON CODE   TAXON                                PROPORTIONAL COUNT   SEDGWICK-RAFTER COUNT
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  1COCPI   COCCONEIS PLACENTULA VAR. LINEATA                    110
  1NAVIA   NAVICULA VIRIDULA VAR. AVENACEA                      P
  1NAARV   NAVICULA ARVENSIS                                    P
  1DIVUL   DIATOMA VULGARE                                      1
  1ACLAD   ACHNANTHES LANCEOLATA VAR. DUBIA                     2
  1NIFRU   NITZSCHIA FRUSTULUM                                  P
  1GOOLI   GOMPHONEMA OLIVACEUM                                 2
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 1NAHEU   NAVICULA HEUFLERI                                             1
 1NIFON   NITZSCHIA FONTICOLA                                           4
 1RHCUR   RHOICOSPHENIA CURVATA                                         1
 1GOPAR   GOMPHONEMA PARVULUM                                           1
 1NASEA   NAVICULA SECRETA VAR. APICULATA                               P
 2OEDSP   OEDOGONIUM SP.                                                              10
 4CHRSP   CHROOCOCCUS SP.                                                              2
 4LYNSP   LYNGBYA SP.                                                                  1

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SAMPLE STATION: WP03 - HUNTER
NUMBER OF REPLICATES - 3

REPLICATE - 2
SAMPLE DATE - 07-02-82

C - 11(      V - 100 ML    DF - 1:49     L - 50 MM    W - .561 MM    D - 1  MM    S - 6    A - 3750 MM2
SUBSTRATE - GLASS SLIDES

LOG NUMBER - 158-PA32      ANALYST - FHB

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                                                              NUMBER COUNTED
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                                                          DIATOMS              NON-DIATOMS
TAXON CODE   TAXON                                   PROPORTIONAL COUNT   SEDGWICK-RAFTER COUNT
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 1COCPI   COCCONEIS PLACENTULA VAR. LINEATA                           101
 1NIFRU   NITZSCHIA FRUSTULUM                                           8
 1NAHEU   NAVICULA HEUFLERI                                             4
 1RHCUR   RHOICOSPHENIA CURVATA                                         4
 1GOOLI   GOMPHONEMA OLIVACEUM                                          7
 1NAVIA   NAVICULA VIRIDULA VAR. AVENACEA                               P
 1NACRV   NAVICULA CRYPTOCEPHALA VAR. VENETA                            2
 1COCPE   COCCONEIS PEDICULUS                                           P
 1COCPU   COCCONEIS PLACENTULA VAR. EUGLYPTA                            1
 1GOPAR   GOMPHONEMA PARVULUM                                           2
 1GOSUB   GOMPHONEMA SUBCLAVATUM                                        1
 1CYMAF   CYMBELLA AFFINIS                                              2
 1NIAPI   NITZSCHIA APICULATA                                           4
 1NIFON   NITZSCHIA FONTICOLA                                           2
 1GOINT   GOMPHONEMA INTRICATUM                                         1
 1FRAVA   FRAGILARIA VAUCHERIAE                                         P
 1NITRL   NITZSCHIA TRYBLIONELLA VAR. LEVIDENSIS                        P
 4ANASP   ANABAENA SP.                                                                 2
 2CHLSP   CHLAMYDOMONAS SP.                                                            1
 2STTEN   STIGEOCLONIUM TENUE                                                          P

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SAMPLE STATION: WP03 - HUNTER
NUMBER OF REPLICATES - 3

REPLICATE - 
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SAMPLE DATE - [illegible]-02-82

C - 154     V - 100 ML    DF - I:49     L - 50 MM    W - .561 MM    D - 1  MM    S - 6    A - 3750 MM2
SUBSTRATE - GLASS SLIDES

LOG NUMBER - 158-PA33      ANALYST - FHB

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                                                                          NUMBER COUNTED
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                                                               DIATOMS               NON-DIATOMS
TAXON CODE    TAXON                                      PROPORTIONAL COUNT   SEDGWICK-RAFTER COUNT
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  INASEA   NAVICULA SECRETA VAR. APICULATA                        2
  INIDIS   NITZSCHIA DISSIPATA                                    3
  1COCPI   COCCONEIS PLACENTULA VAR. LINEATA                     100
  1GOOLI   GOMPHONEMA OLIVACEUM                                   9
  1NAVIA   NAVICULA VIRIDULA VAR. AVENACEA                        3
  1NIFON   NITZSCHIA FONTICOLA                                    2
  1NIFRU   NITZSCHIA FRUSTULUM                                    3
  1ACLAD   ACHNANTHES LANCEOLATA VAR. DUBIA                       P
  1GOTEN   GOMPHONEMA TENELLUM                                    2
  1DITEE   DIATOMA TENUE VAR. ELONGATUM                           P
  1NAHEU   NAVICULA HEUFLERI                                      2
  1SUOVA   SURIRELLA OVATA                                        P
  2STITE   STIGEOCLONIUM TENUE                                                        4
  2OESPP   OEDOGONIUM SP.                                                             2

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PERIPHYTON BENCH SHEET
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CATHEDRAL BLUFFS SHALE OIL COMPANY
PICEANCE CREEK

SAMPLE STATION: WPO1 - STEWART
NUMBER OF REPLICATES - 3

REPLICATE - 1
SAMPLE OATE - 10-04-82

C - 326     V - 100 ML   DF - 1:49    L - 50 MM   W - .561 MM   O - 1  MM   S - 2    A - 3750 MM2
SUBSTRATE - GLASS SLIDES

LOG NUMBER - 158-PA34     ANALYST - FHB

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                                                                   NUMBER COUNTED
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                                                             DIATOMS               NON-DIATOMS
TAXON CODE   TAXON                                     PROPORTIONAL COUNT   SEDGWICK-RAFTER COUNT
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  1NAVIA   NAVICULA VIRIDULA VAR. AVENACEA                       100
  1NIFRU   NITZSCHIA FRUSTULUM                                   15
  1NIOIS   NITZSCHIA DISSIPATA                                   50
  1AMPER   AMPHORA PERPUSILLA                                    9
  1NACRV   NAVICULA CRYPTOCEPHALA VAR. VENETA                    9
  1ACMIN   ACHNANTHES MINUTISSIMA                                57
  1FRAVA   FRAGILARIA VAUCHERIAE                                 1
  1RHCUR   RHOICOSPHENIA CURVATA                                 6
  1CYMAF   CYMBELLA AFFINIS                                      1
  1NAHEU   NAVICULA HEUFLERI                                     15
  1GOPAR   GOMPHONEMA PARVULUM                                   7
  1COCPI   COCCONEIS PLACENTULA VAR. LINEATA                     4
  1NANUT   NAVICULA NOTHA                                        5
  1CYCME   CYCLOTELLA MENEGHINIANA                               1
  1NAMIN   NAVICULA MINIMA                                       5
  1NASEA   NAVICULA SECRETA VAR. APICULATA                       9
  1GOOLI   GOMPHONEMA OLIVACEUM                                  1
  1SUOVA   SURIRELLA OVATA                                       1
  1ACLAD   ACHNANTHES LANCEOLATA VAR. DUBIA                      1
  1CYMSI   CYMBELLA SINUATA                                      P
  1NATSC   NAVICULA TRIPUNCTATA VAR. SCHIZONEMOIDES              P
  1NAMUT   NAVICULA MUTICA                                       P
  4OSTEN   OSCILLATORIA TENVIS                                                     2
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SAMPLE STATIUN: WPO1 - STEWART
NUMBER OF REPLICATES - 3

REPLICATE - 2
SAMPLE DATE - 10-04-82

C - 384     V - 100 ML   DF - 1:49    L - 50 MM   W - .561 MM   O - 1  MM   S - 2    A - 3750 MM2
SUBSTRATE - GLASS SLIDES
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LOG NUMBER - 158-PA35   ANALYST - FHB

TAXON CODE	TAXON	NUMBER COUNTED DIATOMS PROPORTIONAL COUNT	NON-DIATOMS SEDGWICK-RAFTER COUNT
1ACMIN	ACHNANTHES MINUTISSIMA	76	
1NAVIA	NAVICULA VIRIDULA VAR. AVENACEA	101	
1NIDIS	NITZSCHIA DISSIPATA	51	
1NAHEU	NAVICULA HEUFLERI	10	
1NACRV	NAVICULA CRYPTOCEPHALA VAR. VENETA	22	
1SUOVA	SURIRELLA OVATA	1	
1NIFRU	NITZSCHIA FRUSTULUM	20	
1RHCUR	RHOICOSPHENIA CURVATA	10	
1NAMIN	NAVICULA MINIMA	1	
1AMPER	AMPHORA PERPUSILLA	4	
1GOOLI	GOMPHONEMA OLIVACEUM	3	
1COCPI	COCCONEIS PLACENTULA VAR. LINEATA	5	
1NATSC	NAVICULA TRIPUNCTATA VAR. SCHIZONEMOIDES	1	
1NASEA	NAVICULA SECRETA VAR. APICULATA	11	
1NANOT	NAVICULA NOTHA	10	
1NAARV	NAVICULA ARVENSIS	4	
1ACLAD	ACHNANTHES LANCEOLATA VAR. DUBIA	2	
1GOPAR	GOMPHONEMA PARVULUM	3	
1NASAI	NAVICULA SALINARUM VAR. INTERMEDIA	P	
1CYMSI	CYMBELLA SINUATA	1	
1DIVUL	DIATOMA VULGARE	P	
1SYULN	SYNEDRA ULNA	P	
1CYMMS	CYMBELLA MINUTA VAR. SILESIACA	P	
1CYMAF	CYMBELLA AFFINIS	P	
2STITE	STIGEOCLONIUM TENUE		P

SAMPLE STATION: WP01 - STEWART
NUMBER OF REPLICATES - 3

REPLICATE - 3
SAMPLE DATE - 10-04-82

C - 387   V - 100 ML   DF - 1:49   L - 50 MM   W - .561 MM   D - 1 MM   S - 2   A - 3750 MM2
SUBSTRATE - GLASS SLIDES

LOG NUMBER - 158-PA36   ANALYST - FHB

TAXON CODE	TAXON	NUMBER COUNTED DIATOMS PROPORTIONAL COUNT	NON-DIATOMS SEDGWICK-RAFTER COUNT
1AMPER	AMPHORA PERPUSILLA	5	
1ACLAD	ACHNANTHES LANCEOLATA VAR. DUBIA	2	

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  1ACMIN   ACHNANTHES MINUTISSIMA                                    101
  1NIDIS   NITZSCHIA DISSIPATA                                       83
  1NAVIA   NAVICULA VIRIDULA VAR. AVENACEA                           62
  1FRAVA   FRAGILARIA VAUCHERIAE                                     7
  1NASEA   NAVICULA SECRETA VAR. APICULATA                           11
  1NIFRU   NITZSCHIA FRUSTULUM                                       17
  1NAHEU   NAVICULA HEUFLERI                                         11
  1GOOLI   GOMPHONEMA OLIVACEUM                                      3
  1NACRV   NAVICULA CRYPTOCEPHALA VAR. VENETA                        10
  1GOPAR   GOMPHONEMA PARVULUM                                       12
  1GOSPP   GOMPHONEMA SP.                                            1
  1GOGRA   GOMPHONEMA GRACILE                                        P
  1GOTEN   GOMPHONEMA TENELLUM                                       2
  1RHCUR   RHOICOSPHENIA CURVATA                                     5
  1NAARV   NAVICULA ARVENSIS                                         1
  1NANOT   NAVICULA NOTHA                                            11
  1NAMIN   NAVICULA MINIMA                                           1
  1COCPI   COCCONEIS PLACENTULA VAR. LINEATA                         2
  1NIPAL   NITZSCHIA PALEA                                           1
  1SYDEL   SYNEDRA DELICATISSIMA                                     P
  1NILIN   NITZSCHIA LINEARIS                                        1
  1SUOVA   SURIRELLA OVATA                                           1
  1NATSC   NAVICULA TRIPUNCTATA VAR. SCHIZONEMOIDES                  1
  1DIVUL   DIATOMA VULGARE                                           P
  1CYMAF   CYMBELLA AFFINIS                                          P
  1NASAI   NAVICULA SALINARUM VAR. INTERMEDIA                        P
  1CYMMS   CYMBELLA MINUTA VAR. SILESIACA                            P

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SAMPLE STATION: WP02 - MIDDLE
NUMBER OF REPLICATES - 3

REPLICATE - 1
SAMPLE DATE - 10-04-82

C - 116     V - 100 ML   DF - 1:49    L - 50 MM   W - .561 MM   D - 1  MM   S - 2    A - 3750 MM2
SUBSTRATE - GLASS SLIDES

LOG NUMBER - 158-PA37     ANALYST - FHB

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                                                                         NUMBER COUNTED
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                                                                  DIATOMS               NON-DIATOMS
TAXON CODE   TAXON                                           PROPORTIONAL COUNT   SEDGWICK-RAFTER COUNT
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  1NIDIS   NITZSCHIA DISSIPATA                                        46
  1NAVIA   NAVICULA VIRIDULA VAR. AVENACEA                            100
  1ACMIN   ACHNANTHES MINUTISSIMA                                     44
  1COCPE   COCCONEIS PEDICULUS                                        2
  1NIFRU   NITZSCHIA FRUSTULUM                                        22
  1GOPAR   GOMPHONEMA PARVULUM                                        11
  1RHCUR   RHOICOSPHENIA CURVATA                                      12
  1AMPER   AMPHORA PERPUSILLA                                         14
  1NASAI   NAVICULA SALINARUM VAR. INTERMEDIA                         6
  1NASEA   NAVICULA SECRETA VAR. APICULATA                            12
  1COCPI   COCCONEIS PLACENTULA VAR. LINEATA                          21
  1ACLAD   ACHNANTHES LANCEOLATA VAR. DUBIA                          6
  1NACRV   NAVICULA CRYPTOCEPHALA VAR. VENETA                        11
  1NAHEU   NAVICULA HEUFLERI                                         12
  1NATSC   NAVICULA TRIPUNCTATA VAR. SCHIZONEMOIDES                  2
  1GOTEN   GOMPHONEMA TENELLUM                                       2
  1GOOLI   GOMPHONEMA OLIVACEUM                                      5
  1FRAVA   FRAGILARIA VAUCHERIAE                                     2
  1NAMIN   NAVICULA MINIMA                                           5
  1NANOT   NAVICULA NOTHA                                            5
  1CYMMS   CYMBELLA MINUTA VAR. SILESIACA                            2
  1ACLIN   ACHNANTHES LINEARIS                                       2
  1CYCME   CYCLOTELLA MENEGHINIANA                                   3
  1NAMUT   NAVICULA MUTICA                                           1
  1CYMSI   CYMBELLA SINUATA                                          2
  1NIAMP   NITZSCHIA AMPHIBIA                                        1
  1CYMAF   CYMBELLA AFFINIS                                          1
  1NAARV   NAVICULA ARVENSIS                                         3
  1FRACB   FRAGILAREA CONSTRUENS VAR. BINODIS                        5
  1NIFON   NITZSCHIA FONTICOLA                                       1
  1SUOVA   SURIRELLA OVATA                                           P
  1NISIE   NITZSCHIA SIGMOIDEA                                       P
  1SUANG   SURIRELLA ANGUSTATA                                       P
  4OSSPP   OSCILLATORIA SP.                                                       P
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SAMPLE STATION: WPO2 - MIDDLE
NUMBER OF REPLICATES - 3

REPLICATE - 2
SAMPLE DATE - 10-04-82

C - 201     V - 100 ML   DF - 1:49    L - 50 MM   W - .561 MM   D - 1  MM   S - 2    A - 3750 MM2
SUBSTRATE - GLASS SLIDES

LOG NUMBER - 158-PA38     ANALYST - FHB

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                                                             NUMBER COUNTED
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                                                          DIATOMS              NON-DIATOMS
TAXON CODE   TAXON                                   PROPORTIONAL COUNT   SEDGWICK-RAFTER COUNT
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  1NAVIA   NAVICULA VIRIDULA VAR. AVENACEA                           100
  1SUOVA   SURIRELLA OVATA                                           P
  1CYMSI   CYMBELLA SINUATA                                          1
  1AMPER   AMPHORA PERPUSILLA                                        7
  1FRAVA   FRAGILARIA VAUCHERIAE                                     5
  1RHCUR   RHOICOSPHENIA CURVATA                                     5
  1NIFRU   NITZSCHIA FRUSTULUM                                       15
  1HANAM   HANTZSCHIA AMPHIOXYS                                      1
  1ACLAD   ACHNANTHES LANCEOLATA VAR. DUBIA                          3
  1ACMIN   ACHNANTHES MINUTISSIMA                                    22
  1NACRV   NAVICULA CRYPTOCEPHALA VAR. VENETA                        8
  1NIDIS   NITZSCHIA DISSIPATA                                       14
  1FRALE   FRAGILARIA LEPTOSTAURON                                   2
  1GOPAR   GOMPHONEMA PARVULUM                                       2
  1NASEA   NAVICULA SECRETA VAR. APICULATA                           10
  1NAHEU   NAVICULA HEUFLERI                                    6
  1GOOLI   GOMPHONEMA OLIVACEUM                                 2
  1SYSPP   SYNEDRA SP.                                          1
  1ACLAN   ACHNANTHES LANCEOLATA                                1
  1COCPI   COCCONEIS PLACENTULA VAR. LINEATA                    6
  1NAMUU   NAVICULA MUTICA VAR. UNDULATA                        1
  1NAPUP   NAVICULA PUPULA                                      2
  1FRACV   FRAGILARIA CONSTRUENS VAR. VENTER                    1
  1NIPAL   NITZSCHIA PALEA                                      2
  1CYMMS   CYMBELLA MINUTA VAR. SILESIACA                       1
  1CYMAF   CYMBELLA AFFINIS                                     P
  1NIAPI   NITZSCHIA APICULATA                                  P
  1NATSC   NAVICULA TRIPUNCTATA VAR. SCHIZONEMOIDES             P
  1GYSPI   GYROSIGMA SPENCERII                                  P
  1PIBRE   PINNULARIA BREBISSONII                               P
  1NILIN   NITZSCHIA LINEARIS                                   P
  1STASM   STAURONEIS SMITHII                                   P
  1COCPE   COCCONEIS PEDICULUS                                  P
  1DIVUL   DIATOMA VULGARE                                      P
  1NISIE   NITZSCHIA SIGMOIDEA                                  P
  1SYULN   SYNEDRA ULNA                                         P
  4LYNSP   LYNGBYA SP.                                                         1
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SAMPLE STATION: WP02 - MIDDLE
NUMBER OF REPLICATES - 3

REPLICATE - 3
SAMPLE DATE - 10-04-82

C - 181     V - 100 ML    DF - 1149    L - 50 MM    W - .561 MM    D - 1  MM    S - 2    A - 3750 MM2
SUBSTRATE - GLASS SLIDES

LOG NUMBER - 158-PA39     ANALYST - FHB

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                                                             NUMBER COUNTED
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                                                         DIATOMS              NON-DIATOMS
TAXON CODE   TAXON                                  PROPORTIONAL COUNT   SEDGWICK-RAFTER COUNT
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  1NIAPI   NITZSCHIA APICULATA                                  P
  1NAVIA   NAVICULA VIRIDULA VAR. AVENACEA                      100
  1NIDIS   NITZSCHIA DISSIPATA                                  22
  1NIFRU   NITZSCHIA FRUSTULUM                                  22
  1UNPEN   UNIDENTIFIED PENNATE DIATOMS                         2
  1COCPI   COCCONEIS PLACENTULA VAR. LINEATA                    8
  1NACRV   NAVICULA CRYPTOCEPHALA VAR. VENETA                   14
  1ACMIN   ACHNANTHES MINUTISSIMA                               13
  1AMPER   AMPHORA PERPUSILLA                                   6
  1GOPAR   GOMPHONEMA PARVULUM                                  5
  1NISPP   NITZSCHIA SP.                                        1
  1RHCUR   RHOICOSPHENIA CURVATA                                6
  1NASLA   NAVICULA SECRETA VAR. APICULATA                      12
  1CYCME   CYCLOTELLA MENEGHINIANA                              2
  1NATSC   NAVICULA TRIPUNCTATA VAR. SCHIZONEMOIDES             4
  1NIPAL   NITZSCHIA PALEA                                      1
  1SUOVA   SURIRELLA OVATA                                2
  1FRAVA   FRAGILARIA VAUCHERIAE                          2
  1ACLAD   ACHNANTHES LANCEOLATA VAR. DUBIA               5
  1NAHEU   NAVICULA HEUFLERI                              4
  1NASAI   NAVICULA SALINARUM VAR. INTERMEDIA             5
  1FRURH   FRUSTULIA RHOMBOIDES                           2
  1NANOT   NAVICULA NOTHA                                 6
  1AMOVP   AMPHORA OVALIS                                 P
  1UNPEN   UNIDENTIFIED PENNATE DIATOMS                   2
  1SYFAS   SYNEDRA FASCICULATA                            P
  1GOOLI   GOMPHONEMA OLIVACEUM                           P
  1CYMMS   CYMBELLA MINUTA VAR. SILESIACA                 P
  1NILIN   NITZSCHIA LINEARIS                             P
  1DIVUL   DIATOMA VULGARE                                P
  1COCPE   COCCONEIS PEDICULUS                            P
  1CYMCY   CYMBELLA CYMBIFORMIS                           P
  1NIACI   NITZSCHIA ACICULARIS                           P
  1GYSPE   GYROSIGMA SPENCERII                            P
  1HANAM   HANTZSCHIA AMPHIOXYS                           P
  5EUSPP   EUGLENA SP.                                                          1

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SAMPLE STATION: WP03 - HUNTER
NUMBER OF REPLICATES - 3

REPLICATE - 1
SAMPLE DATE - 10-04-82

C - 156     V - 100 ML   DF - 1:49   L - 50 MM   W - .561 MM   D - 1  MM   S - 4    A - 3750 MM2
SUBSTRATE - GLASS SLIDES

LOG NUMBER - 158-PA40     ANALYST - FHB

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                                                   NUMBER COUNTED
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                                                 DIATOMS              NON-DIATOMS
TAXON CODE   TAXON                          PROPORTIONAL COUNT   SEDGWICK-RAFTER COUNT
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  1AMPER   AMPHORA PERPUSILLA                            12
  1ACMIN   ACHNANTHES MINUTISSIMA                       100
  1NAVIA   NAVICULA VIRIDULA VAR. AVENACEA               27
  1NIDIS   NITZSCHIA DISSIPATA                           63
  1NIFRU   NITZSCHIA FRUSTULUM                           72
  1NAHEU   NAVICULA HEUFLERI                             21
  1GOPAR   GOMPHONEMA PARVULUM                           22
  1COCPI   COCCONEIS PLACENTULA VAR. LINEATA             28
  1FRALE   FRAGILARIA LEPTOSTAURON                        1
  1FRAVA   FRAGILARIA VAUCHERIAE                          2
  1NASEA   NAVICULA SECRETA VAR. APICULATA               19
  1RHCUR   RHOICOSPHENIA CURVATA                         25
  1GOOLI   GOMPHONEMA OLIVACEUM                          10
  1ACLAD   ACHNANTHES LANCEOLATA VAR. DUBIA               9
  1DEELE   DENTICULA ELEGANS                              2
  1THSPP   THALASSIOSIRA FLUVIATILIS                      2
  1NANOT   NAVICULA NOTHA                                 9
  1NAMIN   NAVICULA MINIMA                                2
  1HANAM   HANTZSCHIA AMPHIOXYS                                    P
  1NACRV   NAVICULA CRYPTOCEPHALA VAR. VENETA                      14
  1NAARV   NAVICULA ARVENSIS                                       3
  1GOTEN   GOMPHONEMA TENELLUM                                     6
  1NATSC   NAVICULA TRIPUNCTATA VAR. SCHIZONEMOIDES                2
  1SUOVA   SURIRELLA OVATA                                         1
  1SYACU   SYNEDRA ACUS                                            1
  1RHMUS   RHOPALODIA MUSCULUS                                     2
  1CYMMS   CYMBELLA MINUTA VAR. SILESIACA                          P
  1DIVUL   DIATOMA VULGARE                                         P
  2STITE   STIGEOCLONIUM TENUE                                                 3

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SAMPLE STATION: WP03 - HUNTER
NUMBER OF REPLICATES - 3

REPLICATE - 2
SAMPLE DATE - 10-04-82

C - 57      V - 100 ML   DF - 1:49    L - 50 MM    W - .561 MM    D - 1  MM    S - 6    A - 3750 MM2
SUBSTRATE - GLASS SLIDES

LOG NUMBER - 158-PA41     ANALYST - FHB

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                                                             NUMBER COUNTED
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                                                         DIATOMS             NON-DIATOMS
TAXON CODE   TAXON                                  PROPORTIONAL COUNT   SEDGWICK-RAFTER COUNT
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  1ACMIN   ACHNANTHES MINUTISSIMA                                  45
  1NANOT   NAVICULA NOTHA                                          8
  1RHCUR   RHOICOSPHENIA CURVATA                                   85
  1NIDIS   NITZSCHIA DISSIPATA                                     20
  1COCPI   COCCONEIS PLACENTULA VAR. LINEATA                       52
  1NAMIN   NAVICULA MINIMA                                         2
  1NASAI   NAVICULA SALINARUM VAR. INTERMEDIA                      3
  1NAHEU   NAVICULA HEUFLERI                                       20
  1NAVIA   NAVICULA VIRIDULA VAR. AVENACEA                         100
  1NISPP   NITZSCHIA SP.                                           4
  1NIFRU   NITZSCHIA FRUSTULUM                                     37
  1NASEA   NAVICULA SECRETA VAR. APICULATA                         10
  1GOOLI   GOMPHONEMA OLIVACEUM                                    27
  1FRALE   FRAGILARIA LEPTOSTAURON                                 4
  1GOPAR   GOMPHONEMA PARVULUM                                     4
  1ACLAD   ACHNANTHES LANCEOLATA VAR. DUBIA                        5
  1NIAPI   NITZSCHIA APICULATA                                     7
  1NAMUU   NAVICULA MUTICA VAR. UNDULATA                           P
  1AMPER   AMPHORA PERPUSILLA                                      8
  1GOSPP   GOMPHONEMA SP.                                          3
  1CYCME   CYCLOTELLA MENEGHINIANA                                 3
  1UNPEN   UNIDENTIFIED PENNATE DIATOMS                            2
  1CYMAF   CYMBELLA AFFINIS                                        2
  1SUOVA   SURIRELLA OVATA                                         2
  1AMOVF   AMPHORA OVALIS VAR. AFFINIS                             1
  1GOTEN   GOMPHONEMA TENELLUM                                     1
  1RHMUS   RHOPALODIA MUSCULUS                                     3
  1NAPUC   NAVICULA PUPULA VAR. CAPITATA                              1
  1SYPUC   SYNEDRA PULCHELLA                                          P
  1SUUVA   SURIRELLA OVATA                                            2
  1NAMUT   NAVICULA MUTICA                                            2
  1STANL   STAURONEIS ANICEPS                                         1
  1FRACB   FRAGILAREA CONSTRUENS VAR. BINODIS                         7
  1PIBRE   PINNULARIA BREBISSONII                                     3
  1SYULN   SYNEDRA ULNA                                               1
  1CYMAF   CYMBELLA AFFINIS                                           1
  1FRURH   FRUSTULIA RHOMBOIDES                                       2
  1NACRV   NAVICULA CRYPTOCEPHALA VAR. VENETA                         5
  1ENORN   ENTOMONEIS ORNATA                                          1
  1STSPP   STEPHANODISCUS SP.                                         1
  1NIHUN   NITZSCHIA HUNGARICA                                        1
  2STITE   STIGEOCLONIUM TENUE                                                      3

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SAMPLE STATION: WP03 - HUNTER
NUMBER OF REPLICATES - 3

REPLICATE - 3
SAMPLE DATE - 10-04-82

C - 57      V - 100 ML   DF - 1:49    L - 50 MM   W - .561 MM   D - 1  MM   S - 6    A - 3750 MM2
SUBSTRATE - GLASS SLIDES

LOG NUMBER - 150-PA42      ANALYST - FHB

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                                                                  NUMBER COUNTED
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                                                           DIATOMS             NON-DIATOMS
TAXON CODE   TAXON                                    PROPORTIONAL COUNT   SEDGWICK-RAFTER COUNT
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  INIDIS   NITZSCHIA DISSIPATA                                        26
  IRHCUR   RHOICOSPHENIA CURVATA                                      100
  IACLAD   ACHNANTHES LANCEOLATA VAR. DUBIA                           7
  IAMPER   AMPHORA PERPUSILLA                                         10
  INAVIA   NAVICULA VIRIDULA VAR. AVENACEA                            65
  INIDIS   NITZSCHIA DISSIPATA                                        38
  ICOCPI   COCCONEIS PLACENTULA VAR. LINEATA                          41
  INIFRU   NITZSCHIA FRUSTULUM                                        49
  INAMUU   NAVICULA MUTICA VAR. UNDULATA                              1
  INAHEU   NAVICULA HEUFLERI                                          19
  IACMIN   ACHNANTHES MINUTISSIMA                                     80
  IGOPAR   GOMPHONEMA PARVULUM                                        29
  IDEELE   DENTICULA ELEGANS                                          5
  IGOOLI   GOMPHONEMA OLIVACEUM                                       20
  INASEA   NAVICULA SECRETA VAR. APICULATA                            17
  INAARV   NAVICULA ARVENSIS                                          5
  IRHMUS   RHOPALODIA MUSCULUS                                        2
  INACRV   NAVICULA CRYPTOCEPHALA VAR. VENETA                         8
  INAPUP   NAVICULA PUPULA                                            3
  ISTSPP   STEPHANODISCUS SP.                                         2
  IGOTEN   GOMPHONEMA TENELLUM                                        6
  IFRAVA   FRAGILARIA VAUCHERIAE                                      4
  INANOT   NAVICULA NOTHA                                             3
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1NIAPI   NITZSCHIA APICULATA                               1
1CYMAF   CYMBELLA AFFINIS                                  3
1SUOVA   SURIRELLA OVATA                                   1
2STITE   STIGEOCLONIUM TENUE                                            1
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PERIPHYTON BENCH SHEET

CATHEDRAL BLUFFS SHALE OIL COMPANY
PICEANCE CREEK

SAMPLE STATION: WP01 - STEWART
NUMBER OF REPLICATES - 3

REPLICATE - 1
SAMPLE DATE - 11-03-82

C - 158 V - 100 ML DF - 1:49 L - 50 MM W - .561 MM D - 1 MM S - 2 A - 3750 MM2
SUBSTRATE - GLASS SLIDES

LOG NUMBER - 158-PA43 ANALYST - FHB

		NUMBER COUNTED	
		DIATOMS	NON-DIATOMS
TAXON CODE	TAXON	PROPORTIONAL COUNT	SEDGWICK-RAFTER COUNT
1NAVIA	NAVICULA VIRIDULA VAR. AVENACEA	101	
1GOOLI	GOMPHONEMA OLIVACEUM	15	
1NACRV	NAVICULA CRYPTOCEPHALA VAR. VENETA	23	
1NATSC	NAVICULA TRIPUNCTATA VAR. SCHIZONEMOIDES	1	
1ACLAD	ACHNANTHES LANCEOLATA VAR. DUBIA	1	
1NANOT	NAVICULA NOTHA	5	
1NIDIS	NITZSCHIA DISSIPATA	32	
1NIFRU	NITZSCHIA FRUSTULUM	6	
1NASAI	NAVICULA SALINARUM VAR. INTERMEDIA	3	
1RHCUR	RHOICOSPHENIA CURVATA	3	
1SUOVA	SURIRELLA OVATA	1	
1CYCME	CYCLOTELLA MENEGHINIANA	2	
1COCPI	COCCONEIS PLACENTULA VAR. LINEATA	1	
1ACMIN	ACHNANTHES MINUTISSIMA	12	
1NAHEU	NAVICULA HEUFLERI	2	
1CYMMS	CYMBELLA MINUTA VAR. SILESIACA	2	
1AMPER	AMPHORA PERPUSILLA	2	
1NASEA	NAVICULA SECRETA VAR. APICULATA	5	
1NIAPI	NITZSCHIA APICULATA	1	
1DITEE	DIATOMA TENUE VAR. ELONGATUM	1	
1NICAP	NITZSCHIA CAPITELLATA	P	
1NAMUU	NAVICULA MUTICA VAR. UNDULATA	1	
1NISIE	NITZSCHIA SIGMOIDEA	P	
1NATRI	NAVICULA TRIPUNCTATA	1	
1GOPAR	GOMPHONEMA PARVULUM	1	
1DIVUL	DIATOMA VULGARE	P	
1SYDEL	SYNEDRA DELICATISSIMA	P	
1CYMAF	CYMBELLA AFFINIS	P	
1NILIN	NITZSCHIA LINEARIS	P	
4ANASP	ANABAENA SP.		P
4LYNSP	LYNGBYA SP.		1

SAMPLE STATION: WP01 - STEWART

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NUMBER OF REPLICATES - 3

REPLICATE - 2
SAMPLE DATE - 11-03-82

C - 162      V - 100 ML    DI - 1:49     L - 50 MM    W - .561 MM    D - 1  MM    S - 2     A - 3750 MM2
SUBSTRATE - GLASS SLIDES

LOG NUMBER - 158-PA44      ANALYST - FHB

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                                                                          NUMBER COUNTED
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                                                                  DIATOMS                NON-DIATOMS
TAXON CODE   TAXON                                         PROPORTIONAL COUNT   SEDGWICK-RAFTER COUNT
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  1GOOLI    GOMPHONEMA OLIVACEUM                                    46
  1NAVIA    NAVICULA VIRIDULA VAR. AVENACEA                        100
  1RHCUR    RHOICUSPHENIA CURVATA                                   2
  1NIPAL    NITZSCHIA PALEA                                         1
  1NATSC    NAVICULA TRIPUNCTATA VAR. SCHIZONEMOIDES                P
  1NIDIS    NITZSCHIA DISSIPATA                                     52
  1NASAI    NAVICULA SALINARUM VAR. INTERMEDIA                      8
  1NACRV    NAVICULA CRYPTOCEPHALA VAR. VENETA                      34
  1ACMIN    ACHNANTHES MINUTISSIMA                                  23
  1NASEA    NAVICULA SECRETA VAR. APICULATA                         11
  1NIFRU    NITZSCHIA FRUSTULUM                                     13
  1NANOT    NAVICULA NOTHA                                          8
  1NAHEU    NAVICULA HEUFLERI                                       4
  1COCPE    COCCONEIS PEDICULUS                                     1
  1NATRI    NAVICULA TRIPUNCTATA                                    2
  1DIVUL    DIATOMA VULGARE                                         1
  1NAMIN    NAVICULA MINIMA                                         1
  1HANAM    HANTZSCHIA AMPHIOXYS                                    1
  1ACLAN    ACHNANTHES LANCEOLATA                                   P
  1COCPI    COCCONEIS PLACENTULA VAR. LINEATA                       2
  1NIAPI    NITZSCHIA APICULATA                                     1
  1GOPAR    GOMPHONEMA PARVULUM                                     1
  1SUOVA    SURIRELLA OVATA                                         1
  1CYMSI    CYMBELLA SINUATA                                        1
  1CYMMS    CYMBELLA MINUTA VAR. SILESIACA                          P
  1AMOVF    AMPHORA OVALIS VAR. AFFINIS                             P
  1CYMAF    CYMBELLA AFFINIS                                        P
  1NAMUT    NAVICULA MUTICA                                         P
  4LYNSP    LYNGBYA SP.                                                                   P

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SAMPLE STATION: WP01 - STEWART
NUMBER OF REPLICATES - 3

REPLICATE - 3
SAMPLE DATE - 11-03-82

C - 164      V - 100 ML    DF - 1:49     L - 50 MM    W - .561 MM    D - 1  MM    S - 2     A - 3750 MM2
SUBSTRATE - GLASS SLIDES

LOG NUMBER - 158-PA45      ANALYST - FHB
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TAXON CODE	TAXON	NUMBER COUNTED DIATOMS - PROPORTIONAL COUNT	NON-DIATOMS SEDGWICK-RAFTER COUNT
1NIDIS	NITZSCHIA DISSIPATA	57	
1NAVIA	NAVICULA VIRIDULA VAR. AVENACEA	100	
1GOOLI	GOMPHONEMA OLIVACEUM	41	
1NASLA	NAVICULA SECRETA VAR. APICULATA	13	
1GOPAR	GOMPHONEMA PARVULUM	3	
1NACRV	NAVICULA CRYPTOCEPHALA VAR. VENETA	40	
1NATRI	NAVICULA TRIPUNCTATA	2	
1NIFRU	NITZSCHIA FRUSTULUM	26	
1NANOI	NAVICULA NOTHA	18	
1ACLIN	ACHNANTHES LINEARIS	3	
1NIPAL	NITZSCHIA PALEA	4	
1AMPER	AMPHORA PERPUSILLA	4	
1RHCUR	RHOICOSPHENIA CURVATA	3	
1ACMIN	ACHNANTHES MINUTISSIMA	38	
1ACLAD	ACHNANTHES LANCEOLATA VAR. DUBIA	2	
1GOTEN	GOMPHONEMA TENELLUM	3	
1COCPI	COCCONEIS PLACENTULA VAR. LINEATA	3	
1NICOM	NITZSCHIA COMMUNIS	1	
1SUOVA	SURIRELLA OVATA	5	
1FRAVA	FRAGILARIA VAUCHERIAE	1	
1GOSUB	GOMPHONEMA SUBCLAVATUM	2	
1CYCME	CYCLOTELLA MENEGHINIANA	1	
1NICAP	NITZSCHIA CAPITELLATA	2	
1AMVEN	AMPHORA VENETA	1	
1NAMUI	NAVICULA MUTICA	1	
1NARHY	NAVICULA RHYNCHOCEPHALA	2	
1NASAI	NAVICULA SALINARUM VAR. INTERMEDIA	1	
1NIPAC	NITZSCHIA PALEACEA	1	
1DIVUL	DIATOMA VULGARE	1	
1FRACB	FRAGILAREA CONSTRUENS VAR. BINODIS	5	
1SYACU	SYNEDRA ACUS	P	
4LYNSP	LYNGBYA SP.		P

SAMPLE STATION: WP02 - MIDDLE
NUMBER OF REPLICATES - 3

REPLICATE - 1
SAMPLE DATE - 11-03-82

C - 232 V - 100 ML DF - 1:49 L - 50 MM W - .561 MM D - 1 MM S - 2 A - 3750 MM2
SUBSTRATE - GLASS SLIDES

LOG NUMBER - I58-PA46 ANALYST - FHB

NUMBER COUNTED

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                                                                   DIATOMS              NON-DIATOMS
TAXON CODE   TAXON                                           PROPORTIONAL COUNT   SEDGWICK-RAFTER COUNT
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  1NAVIA   NAVICULA VIRIDULA VAR. AVENACEA                          101
  1GOOLI   GOMPHONEMA OLIVACEUM                                     22
  1NASEA   NAVICULA SECRETA VAR. APICULATA                          10
  1NIFRU   NITZSCHIA FRUSTULUM                                      18
  1ACLAD   ACHNANTHES LANCEOLATA VAR. DUBIA                         10
  1NACRV   NAVICULA CRYPTOCEPHALA VAR. VENETA                       7
  1NIDIS   NITZSCHIA DISSIPATA                                      28
  1UNPLN   UNIDENTIFIED PENNATE DIATOMS                             3
  1SUOVA   SURIRELLA OVATA                                          2
  1ACMIN   ACHNANTHES MINUTISSIMA                                   21
  1NAHEU   NAVICULA HEUFLERI                                        3
  1COCPI   COCCONEIS PLACENTULA VAR. LINEATA                        3
  1NANOT   NAVICULA NOTHA                                           5
  1CYMAF   CYMBELLA AFFINIS                                         1
  1NAARV   NAVICULA ARVENSIS                                        1
  1NASAI   NAVICULA SALINARUM VAR. INTERMEDIA                       2
  1CYMAF   CYMBELLA AFFINIS                                         2
  1GOPAR   GOMPHONEMA PARVULUM                                      5
  1CYMSI   CYMBELLA SINUATA                                         2
  1RHCUR   RHOICOSPHENIA CURVATA                                    3
  1SYDEL   SYNEDRA DELICATISSIMA                                    1
  1NITRL   NITZSCHIA TRYBLIONELLA VAR. LEVIDENSIS                   1
  1NATRI   NAVICULA TRIPUNCTATA                                     1
  1AMPER   AMPHORA PERPUSILLA                                       3
  1FRAVA   FRAGILARIA VAUCHERIAE                                    1
  1FRACO   FRAGILARIA CONSTRUENS                                    1
  1NAMIN   NAVICULA MINIMA                                          2
  1CYCME   CYCLOTELLA MENEGHINIANA                                  1
  1GOTEN   GOMPHONEMA TENELLUM                                      1
  1SYULN   SYNEDRA ULNA                                             1
  1NIAPI   NITZSCHIA APICULATA                                      P
  1THSPP   THALASSIOSIRA FLUVIATILIS                                P
  1NIIGN   NITZSCHIA IGNORATA                                       P

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SAMPLE STATION: WPO2 - MIDDLE
NUMBER OF REPLICATES - 3

REPLICATE - 2
SAMPLE DATE - 11-03-82

C - 200     V - 100 ML   DF - 1:49   L - 50 MM   W - .561 MM   D - 1 MM   S - 2   A - 3750 MM2
SUBSTRATE - GLASS SLIDES

LOG NUMBER - 158-PA47     ANALYST - FHB

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                                                             NUMBER COUNTED
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                                                                   DIATOMS              NON-DIATOMS
TAXON CODE   TAXON                                           PROPORTIONAL COUNT   SEDGWICK-RAFTER COUNT
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  1CYCME   CYCLOTELLA MENEGHINIANA                                  3
  1GOOLI   GOMPHONEMA OLIVACEUM                                  7
  1NAVIA   NAVICULA VIRIDULA VAR. AVENACEA                       105
  1NIDIS   NITZSCHIA DISSIPATA                                   70
  1UNPEN   UNIDENTIFIED PENNATE DIATOMS                          3
  1NASAI   NAVICULA SALINARUM VAR. INTERMEDIA                    2
  1NISPP   NITZSCHIA SP.                                         1
  1GOPAR   GOMPHONEMA PARVULUM                                   4
  1ACLAD   ACHNANTHES LANCEOLATA VAR. DUBIA                      5
  1CYMSI   CYMBELLA SINUATA                                      1
  1ACMIN   ACHNANTHES MINUTISSIMA                                19
  1COCPI   COCCONEIS PLACENTULA VAR. LINEATA                     4
  1NACRV   NAVICULA CRYPTOCEPHALA VAR. VENETA                    17
  1NANOT   NAVICULA NOTHA                                        20
  1NIFRU   NITZSCHIA FRUSTULUM                                   25
  1NASEA   NAVICULA SECRETA VAR. APICULATA                       15
  1FRALE   FRAGILARIA LEPTOSTAURON                               2
  1AMPLR   AMPHORA PERPUSILLA                                    7
  1SUOVA   SURIRELLA OVATA                                       5
  1NAHEU   NAVICULA HEUFLERI                                     2
  1COCPE   COCCONEIS PEDICULUS                                   1
  1NIPAL   NITZSCHIA PALEA                                       2
  1NICAP   NITZSCHIA CAPITELLATA                                 2
  1HANAM   HANTZSCHIA AMPHIOXYS                                  2
  1GOSUB   GOMPHONEMA SUBCLAVATUM                                1
  1CYMMS   CYMBELLA MINUTA VAR. SILESIACA                        1
  1NATSC   NAVICULA TRIPUNCTATA VAR. SCHIZONEMOIDES              2
  1RHCUR   RHOICOSPHENIA CURVATA                                 3
  1NIGRA   NITZSCHIA GRACILIS                                    1
  1SYDEL   SYNEDRA DELICATISSIMA                                 P
  1NILIN   NITZSCHIA LINEARIS                                    P
  1NIAPI   NITZSCHIA APICULATA                                   P
  1NITRL   NITZSCHIA TRYBLIONELLA VAR. LEVIDENSIS                P
  4LYNSP   LYNGBYA SP.                                                          P

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SAMPLE STATION: WP02 - MIDDLE
NUMBER OF REPLICATES - 3

REPLICATE - 3
SAMPLE DATE - 11-03-82

C - 176     V - 100 ML   DF - 1:49    L - 50 MM    W - .561 MM    D - 1  MM    S - 2    A - 3750 MM2
SUBSTRATE - GLASS SLIDES

LOG NUMBER - 158-PA48      ANALYST - FHB

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                                                             NUMBER COUNTED
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                                                         DIATOMS           NON-DIATOMS
TAXON CODE   TAXON                                  PROPORTIONAL COUNT   SEDGWICK-RAFTER COUNT
--------------------------------------------------------------------------------------

  1GOPAR   GOMPHONEMA PARVULUM                                   4
  1NANOT   NAVICULA NOTHA                                        8
  1CYCME   CYCLOTELLA MENEGHINIANA                               1
  1NACRV   NAVICULA CRYPTOCEPHALA VAR. VENETA                    8
  1NASEA   NAVICULA SECRETA VAR. APICULATA                       9
  IACLAD   ACHNANTHES LANCEOLATA VAR. OUBIA                             6
  ISUOVA   SURIRELLA OVATA                                              3
  ICOCPI   COCCONEIS PLACENTULA VAR. LINEATA                            5
  INIAPI   NITZSCHIA APICULATA                                          1
  IACMIN   ACHNANTHES MINUTISSIMA                                       13
  IGOTEN   GOMPHONEMA TENELLUM                                          3
  IRHCUR   RHOICOSPHENIA CURVATA                                        1
  INAMIN   NAVICULA MINIMA                                              1
  IGOOLI   GOMPHONEMA OLIVACEUM                                         16
  INIDIS   NITZSCHIA OISSIPATA                                          17
  INAVIA   NAVICULA VIRIOULA VAR. AVENACEA                              101
  ICOCPU   COCCONEIS PLACENTULA VAR. EUGLYPTA                           2
  ICYMAF   CYMBELLA AFFINIS                                             2
  INIFRU   NITZSCHIA FRUSTULUM                                          8
  ISYACU   SYNEDRA ACUS                                                 1
  INASAI   NAVICULA SALINARUM VAR. INTERMEOIA                           1
  INAHEU   NAVICULA HEUFLERI                                            2
  INASAI   NAVICULA SALINARUM VAR. INTERMEOIA                           1
  ICYMMS   CYMBELLA MINUTA VAR. SILESIACA                               P
  IDIVUL   DIATOMA VULGARE                                              P

--------------------------------------------------------------------------------------------------


SAMPLE STATION: WP03 - HUNTER
NUMBER OF REPLICATES - 3

REPLICATE - 1
SAMPLE DATE - 11-03-82

C - 47      V - 100 ML   DF - 1:49    L - 50 MM    W - .561 MM   D - 1  MM   S - 10   A - 3750 MM2
SUBSTRATE - GLASS SLIOES

LOG NUMBER - 158-PA49     ANALYST - FHB

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                                                                    NUMBER COUNTED
                                                                    --------------

                                                              OIATOMS            NON-DIATOMS
TAXON CODE   TAXON                                       PROPORTIONAL COUNT   SEDGWICK-RAFTER COUNT
--------------------------------------------------------------------------------------------------

  ISYULN   SYNEDRA ULNA                                                 P
  ICYMAF   CYMBELLA AFFINIS                                             6
  INAHEU   NAVICULA HEUFLERI                                            5
  INASEA   NAVICULA SECRETA VAR. APICULATA                              7
  IRHCUR   RHOICOSPHENIA CURVATA                                        18
  IACLAD   ACHNANTHES LANCEOLATA VAR. OUBIA                             18
  IRHMUS   RHOPALODIA MUSCULUS                                          1
  INACRV   NAVICULA CRYPTOCEPHALA VAR. VENETA                           13
  ICOCPI   COCCONEIS PLACENTULA VAR. LINEATA                            10
  INASAI   NAVICULA SALINARUM VAR. INTERMEOIA                           2
  ISYAMP   SYNEDRA AMPHICEPHALA                                         1
  INANOT   NAVICULA NOTHA                                               9
  INIFRU   NITZSCHIA FRUSTULUM                                          20
  IFRAVA   FRAGILARIA VAUCHERIAE                                        6
  INAVIA   NAVICULA VIRIOULA VAR. AVENACEA                              100
  IGOOLI   GOMPHONEMA OLIVACEUM                                         17
  INIDIS   NITZSCHIA OISSIPATA                                          15
  IACMIN   ACHNANTHES MINUTISSIMA                                       22
  INIAPI   NITZSCHIA APICULATA                                    3
  ICYCME   CYCLOTELLA MENEGHINIANA                                2
  IAMPER   AMPHORA PERPUSILLA                                     4
  ISTSPP   STEPHANODISCUS SP.                                     2
  INISIE   NITZSCHIA SIGMOIDEA                                    1
  INATSC   NAVICULA TRIPUNCTATA VAR. SCHIZONEMOIDES               1
  INAMIN   NAVICULA MINIMA                                        1
  ISYACU   SYNEDRA ACUS                                           1
  IGOTEN   GOMPHONEMA TENELLUM                                    2
  IMASPP   MASTOGLOIA SPP.                                        P
  IGOSUB   GOMPHONEMA SUBCLAVATUM                                 P

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SAMPLE STATION: WP03 - HUNTER
NUMBER OF REPLICATES - 3

REPLICATE - 2
SAMPLE DATE - 11-03-82

C - 25     V - 100 ML   DF - 1:49    L - 50 MM   W - .561 MM   D - 1  MM   S - 10   A - 3750 MM2
SUBSTRATE - GLASS SLIDES

LOG NUMBER - 158-PA50     ANALYST - FHB

-----------------------------------------------------------------------------------------------

                                                                   NUMBER COUNTED
                                                                   --------------

                                                                DIATOMS          NON-DIATOMS
TAXON CODE   TAXON                                         PROPORTIONAL COUNT   SEDGWICK-RAFTER COUNT
-----------------------------------------------------------------------------------------------

  INIDIS   NITZSCHIA DISSIPATA                                    30
  IACMIN   ACHNANTHES MINUTISSIMA                                 29
  INAVIA   NAVICULA VIRIDULA VAR. AVENACEA                        100
  INIFRU   NITZSCHIA FRUSTULUM                                    32
  INACRV   NAVICULA CRYPTOCEPHALA VAR. VENETA                     14
  IGOOLI   GOMPHONEMA OLIVACEUM                                   49
  INASEA   NAVICULA SECRETA VAR. APICULATA                        18
  IRHCUR   RHOICOSPHENIA CURVATA                                  13
  IGOTEN   GOMPHONEMA TENELLUM                                    5
  INIPAL   NITZSCHIA PALEA                                        1
  INANOT   NAVICULA NOTHA                                         15
  ICOCPI   COCCONEIS PLACENTULA VAR. LINEATA                      38
  INAHEU   NAVICULA HEUFLERI                                      7
  IACLAD   ACHNANTHES LANCEOLATA VAR. DUBIA                       5
  INIAPI   NITZSCHIA APICULATA                                    4
  IDIVUL   DIATOMA VULGARE                                        2
  ISUOVA   SURIRELLA OVATA                                        1
  IACLAN   ACHNANTHES LANCEOLATA                                  1
  IAMPER   AMPHORA PERPUSILLA                                     9
  IFRALE   FRAGILARIA LEPTOSTAURON                                P
  IAMOVF   AMPHORA OVALIS VAR. AFFINIS                            1
  INASPP   NAVICULA SP.                                           2
  INAMUT   NAVICULA MUTICA                                        5
  ISYULN   SYNEDRA ULNA                                           P
  IFRAVA   FRAGILARIA VAUCHERIAE                                  4
  INIHUN   NITZSCHIA HUNGARICA                                    2
  IGOPAR   GOMPHONEMA PARVULUM                                    3
  IUNPEN   UNIDENTIFIED PENNATE DIATOMS                         1
  ISUOVA   SURIRELLA OVATA                                      2
  IPIBRE   PINNULARIA BREBISSONII                               2
  ICYCME   CYCLOTELLA MENEGHINIANA                              3
  ICYMAF   CYMBELLA AFFINIS                                     2

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SAMPLE STATION: WP03 - HUNTER
NUMBER OF REPLICATES - 3

REPLICATE - 3
SAMPLE DATE - 11-03-82

C - 28      V - 100 ML   DF - 1:49    L - 50 MM   W - .561 MM   D - 1  MM   S - 10   A - 3750 MM2
SUBSTRATE - GLASS SLIDES

LOG NUMBER - I58-PA5I      ANALYST - FHB

-------------------------------------------------------------------------------------------------

                                                                 NUMBER COUNTED
                                                                 --------------

                                                              DIATOMS           NON-DIATOMS
TAXUN CODE   TAXON                                       PROPORTIONAL COUNT   SEDGWICK-RAFTER COUNT
-------------------------------------------------------------------------------------------------

  IRHCUR   RHOICOSPHENIA CURVATA                                9
  IACMIN   ACHNANTHES MINUTISSIMA                               37
  INAVIA   NAVICULA VIRIDULA VAR. AVENACEA                      102
  ICOCPI   COCCONEIS PLACENTULA VAR. LINEATA                    41
  IUNPEN   UNIDENTIFIED PENNATE DIATOMS                         2
  INASEA   NAVICULA SECRETA VAR. APICULATA                      9
  INACRV   NAVICULA CRYPTOCEPHALA VAR. VENETA                   14
  INASAI   NAVICULA SALINARUM VAR. INTERMEDIA                   6
  IGOOLI   GOMPHONEMA OLIVACEUM                                 26
  INIFRU   NITZSCHIA FRUSTULUM                                  30
  INALAD   NAVICULA LANCEOLATA VAR. DUBIA                       2
  ICYCME   CYCLOTELLA MENEGHINIANA                              9
  INIDIS   NITZSCHIA DISSIPATA                                  15
  INIHUN   NITZSCHIA HUNGARICA                                  3
  INANOT   NAVICULA NOTHA                                       12
  INATSC   NAVICULA TRIPUNCTATA VAR. SCHIZONEMOIDES             2
  INAHEU   NAVICULA HEUFLERI                                    3
  IGOTEN   GOMPHONEMA TENELLUM                                  7
  ICYMSI   CYMBELLA SINUATA                                     1
  INAMIN   NAVICULA MINIMA                                      2
  INISIE   NITZSCHIA SIGMOIDEA                                  P
  IGOPAR   GOMPHONEMA PARVULUM                                  5
  ISYACU   SYNEDRA ACUS                                         1
  IFRALE   FRAGILARIA LEPTOSTAURON                              2
  ISUOVA   SURIRELLA OVATA                                      2
  IACMIN   ACHNANTHES MINUTISSIMA                               2
  INAMUT   NAVICULA MUTICA                                      1
  IFRAVA   FRAGILARIA VAUCHERIAE                                3
  ICYMCY   CYMBELLA CYMBIFORMIS                                 1
  INAPUP   NAVICULA PUPULA                                      1
  INIAPI   NITZSCHIA APICULATA                                  3
  ICYMAF   CYMBELLA AFFINIS                                     1
  INIAPI   NITZSCHIA APICULATA                                  1
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1DITTE   DIATOMA TENUE VAR. ELONGATUM                    .  P
1AMPER   AMPHORA PERPUSILLA                                 1
1CYMMS   CYMBELLA MINUTA VAR. SILESIACA                     2
4ANASP   ANABAENA SP.                                                 1
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```

TABLE 2.5.2-12

PERIPHYTON BIOMASS BENCH SHEET

CATHEDRAL BLUFFS SHALE OIL COMPANY
PICEANCE CREEK

SAMPLE DATE - 06-01-82
ANALYST - MARVIN
AREA SCRAPED - 37.5 CM2

STATION-REP	DRY WEIGHT (GM)	ASH WEIGHT (GM)
WP01-1	44.7375	44.7070
WP01-2	45.3290	45.2684
WP01-3	43.5975	48.5644
WP02-1	47.7996	47.7551
WP02-2	41.4530	41.3412
WP02-3	47.2782	47.2062
WP03-1	44.0621	44.0114
WP03-2	46.8168	46.7396
WP03-3	45.0631	45.0222

```
PERIPHYTON BIOMASS BENCH SHEET
------------------------------

CATHEDRAL BLUFFS SHALE OIL COMPANY
PICEANCE CREEK

SAMPLE DATE - 06-30-82
ANALYST - MARVIN
AREA SCRAPED - 37.5 CM2

-------------------------------------------------------------

STATION-REP     DRY WEIGHT (GM)      ASH WEIGHT (GM)
-------------------------------------------------------------

   WP01-1          65.1134              65.0646
   WP01-2          60.8715              60.8084
   WP01-3          62.8146              62.7552
   WP02-1          59.8824              59.8330
   WP02-2          70.2777              70.2294
   WP02-3          57.0896              57.0432
   WP03-1          86.1488              86.0625
   WP03-2          59.2370              59.1692
   WP03-3          92.4188              92.3624

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```

```
PERIPHYION BIOMASS BENCH SHEET
------------------------------

CATHEDRAL BLUFFS SHALE OIL COMPANY
PICEANCE CREEK

SAMPLE DATE - 07-29-82
ANALYST - MARVIN
AREA SCRAPED - 37.5 CM2

-----------------------------------------------------------------

STATION-REP      DRY WEIGHT (GM)      ASH WEIGHT (GM)
-----------------------------------------------------------------

   WP01-1            88.3879              88.3095
   WP01-2            82.6081              82.5546
   WP01-3            77.0779              77.0210
   WP02-1            72.9892              72.9516
   WP02-2            74.1851              74.1495
   WP02-3            73.5242              73.4828

-----------------------------------------------------------------
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PERIPHYTON BIOMASS BENCH SHEET
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CATHEDRAL BLUFFS SHALE OIL COMPANY
PICEANCE CREEK

SAMPLE DATE - 09-02-82
ANALYST - MARVIN
AREA SCRAPED - 37.5 CM2

------------------------------------------------------------------

STATION-REP     DRY WEIGHT (GM)     ASH WEIGHT (GM)
------------------------------------------------------------------

   WP01-1          65.3332             65.2731
   WP01-2          61.0041             60.9491
   WP01-3          62.9369             62.8862
   WP02-1          60.1257             60.0662
   WP02-2          70.3320             70.2746
   WP02-3          57.2417             57.1793
   WP03-1          48.4808             48.4752
   WP03-2          46.9326             46.9278
   WP03-3          46.5448             46.5404

------------------------------------------------------------------
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PERIPHYTON BIOMASS BENCH SHEET

CATHEDRAL BLUFFS SHALE OIL COMPANY
PICEANCE CREEK

SAMPLE DATE - 10-04-82
ANALYST - MARVIN
AREA SCRAPED - 37.5 CM2

STATION-REP	DRY WEIGHT (GM)	ASH WEIGHT (GM)
WP01-1	45.2059	45.1700
WP01-2	44.7313	44.7075
WP01-3	48.6370	48.6028
WP02-1	85.9905	85.9503
WP02-2	59.1120	59.0801
WP02-3	92.4222	92.3791
WP03-1	88.1045	88.0991
WP03-2	82.4414	82.4332
WP03-3	76.8745	76.8641

```
PERIPHYTON BIOMASS BENCH SHEET
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CATHEDRAL BLUFFS SHALE OIL COMPANY
PICEANCE CREEK

SAMPLE DATE - 11-03-82
ANALYST - MARVIN
AREA SCRAPED - 37.5 CM2

------------------------------------------------------------------------

STATION-REP     DRY WEIGHT (GM)     ASH WEIGHT (GM)
------------------------------------------------------------------------

   WP01-1          47.0691             47.0469
   WP01-2          46.7002             46.6773
   WP01-3          47.5790             47.5570
   WP02-1          43.7497             43.7201
   WP02-2          46.6977             46.6762
   WP02-3          46.1394             46.1174
   WP03-1          48.4743             48.4714
   WP03-2          40.5211             40.5209
   WP03-3          44.5665             44.5653

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```

TABLE 2.5.2-13

PERIPHYTON BIOMASS ANALYSIS

CATHEDRAL BLUFFS SHALE OIL COMPANY
PICEANCE CREEK

SAMPLE DATE - 06-01-82
AREA SCRAPED - 37.5 CM2

STATION-REP	DRY WEIGHT (GM)	ASH WEIGHT (GM)	BIOMASS (MG/CM2)	STATION AVERAGE (MG/CM2)
WP01-1	44.7375	44.7070	.813	
WP01-2	45.3290	45.2684	1.616	
WP01-3	48.5975	48.5644	.883	1.104
WP02-1	47.7896	47.7551	.920	
WP02-2	41.4530	41.3412	2.981	
WP02-3	47.2782	47.2062	1.920	1.940
WP03-1	44.0621	44.0114	1.352	
WP03-2	46.8168	46.7396	2.059	
WP03-3	45.0631	45.0222	1.091	1.500

```
PERIPHYTON BIOMASS ANALYSIS
---------------------------

CATHEDRAL BLUFFS SHALE OIL COMPANY
PICEANCE CREEK

SAMPLE DATE - 06-30-82
AREA SCRAPED - 37.5 CM2

-------------------------------------------------------------------------------------------

STATION-REP     DRY WEIGHT (GM)     ASH WEIGHT (GM)     BIOMASS (MG/CM2)     STATION AVERAGE (MG/CM2)

-------------------------------------------------------------------------------------------


   WP01-1          65.1134             65.0646              1.301
   WP01-2          60.8715             60.8084              1.683
   WP01-3          62.8146             62.7552              1.584                1.523
   WP02-1          59.8824             59.8330              1.317
   WP02-2          70.2777             70.2294              1.288
   WP02-3          57.0896             57.0432              1.237                1.281
   WP03-1          86.1488             86.0625              2.301
   WP03-2          59.2370             59.1692              1.808
   WP03-3          92.4188             92.3624              1.504                1.871

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PERIPHYTON BIOMASS ANALYSIS

CATHEDRAL BLUFFS SHALE OIL COMPANY
PICEANCE CREEK

SAMPLE DATE - 07-29-82
AREA SCRAPED - 37.5 CM2

STATION-REP	DRY WEIGHT (GM)	ASH WEIGHT (GM)	BIOMASS (MG/CM2)	STATION AVERAGE (MG/CM2)
WP01-1	88.3879	88.3095	2.091	
WP01-2	82.6081	82.5546	1.427	
WP01-3	77.0779	77.0210	1.517	1.678
WP02-1	72.9892	72.9516	1.003	
WP02-2	74.1851	74.1495	.949	
WP02-3	73.5242	73.4828	1.104	1.019

PERIPHYTON BIOMASS ANALYSIS

CATHEDRAL BLUFFS SHALE OIL COMPANY
PICEANCE CREEK

SAMPLE DATE - 09-02-82
AREA SCRAPED - 37.5 CM2

STATION-REP	DRY WEIGHT (GM)	ASH WEIGHT (GM)	BIOMASS (MG/CM2)	STATION AVERAGE (MG/CM2)
WP01-1	65.3332	65.2731	1.603	
WP01-2	61.0041	60.9491	1.467	
WP01-3	62.9368	62.8862	1.349	1.473
WP02-1	60.1257	60.0662	1.587	
WP02-2	70.3320	70.2946	.997	
WP02-3	57.2417	57.1793	1.664	1.416
WP03-1	48.4808	48.4752	.149	
WP03-2	46.9326	46.9278	.128	
WP03-3	46.5448	46.5404	.117	.132

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PERIPHYTON BIOMASS ANALYSIS
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CATHEDRAL BLUFFS SHALE OIL COMPANY
PICEANCE CREEK

SAMPLE DATE - 10-04-82
AREA SCRAPED - 37.5 CM2

-----------------------------------------------------------------------------------------------

STATION-REP     DRY WEIGHT (GM)     ASH WEIGHT (GM)     BIOMASS (MG/CM2)     STATION AVERAGE (MG/CM2)

-----------------------------------------------------------------------------------------------

  WP01-1          45.2059             45.1700               .957
  WP01-2          44.7313             44.7075               .635
  WP01-3          48.6370             48.6028               .912                   .835
  WP02-1          85.9905             85.9503              1.072
  WP02-2          59.1120             59.0801               .851
  WP02-3          92.4222             92.3791              1.149                  1.024
  WP03-1          88.1045             88.0991               .144
  WP03-2          82.4414             82.4332               .219
  WP03-3          76.8745             76.8641               .277                   .213

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PERIPHYTON BIOMASS ANALYSIS

CATHEDRAL BLUFFS SHALE OIL COMPANY
PICEANCE CREEK

SAMPLE DATE - 11-03-42
AREA SCRAPED - 37.5 CM2

STATION-REP	DRY WEIGHT (GM)	ASH WEIGHT (GM)	BIOMASS (MG/CM2)	STATION AVERAGE (MG/CM2)
WP01-1	47.0691	47.0469	.592	
WP01-2	46.7002	46.6773	.611	
WP01-3	47.5790	47.5570	.587	.596
WP02-1	43.7497	43.7201	.789	
WP02-2	46.6977	46.6762	.573	
WP02-3	46.1394	46.1174	.587	.650
WP03-1	48.4743	48.4714	.077	
WP03-2	40.5211	40.5209	.005	
WP03-3	44.5665	44.5653	.032	.038

TABLE 2.5.2-14

PERIPHYTON DENSITY ANO SPECIES OIVERSITY ESTIMATES

CATHEORAL BLUFFS SHALE OIL COMPANY
PICEANCE CREEK

SAMPLE STATION: WPO1 - STEWART
REPLICATES - 3
SUBSTRATE - GLASS SLIDES

SAMPLE DATE - 06-01-82

TAXON	DENSITY (UNITS/MM2) REP 1	REP 2	REP 3	MEAN	S.D.	% RELATIVE ABUNDANCE
BACILLARIOPHYTA						
ACHNANTHES LANCEOLATA VAR. OUBIA	61.91	74.79	.00	45.57	39.98	1.36
ACHNANTHES LINEARIS	.00	.00	32.85	10.95	18.97	.33
ACHNANTHES MINUTISSIMA	309.54	392.64	492.78	398.32	91.75	11.90
AMPHORA PERPUSILLA	.00	.00	16.43	5.48	9.48	.16
COCCONEIS PLACENTULA VAR. EUGLYPTA	20.64	.00	16.43	12.35	10.90	.37
COCCONEIS PLACENTULA VAR. LINEATA	10.32	.00	16.43	8.91	8.30	.27
CYMBELLA MINUTA	.00	18.70	.00	6.23	10.79	.19
CYMBELLA MINUTA VAR. SILESIACA	.00	56.09	.00	18.70	32.38	.56
CYMBELLA SINUATA	20.64	37.39	65.70	41.24	22.78	1.23
DIATOMA VULGARE	.00	.00	16.43	5.48	9.48	.16
FRAGILARIA CROTONENSIS	20.64	.00	.00	6.88	11.91	.21
FRAGILARIA VAUCHERIAE	10.32	37.39	16.43	21.38	14.20	.64
GOMPHONEMA OLIVACEUM	.00	.00	82.13	27.38	47.42	.82
GOMPHONEMA PARVULUM	.00	74.79	.00	24.93	43.18	.74
GOMPHONEMA TENELLUM	.00	.00	32.85	10.95	18.97	.33
MERIDION CIRCULARE	.00	.00	16.43	5.48	9.48	.16
NAVICULA ARVENSIS	10.32	.00	.00	3.44	5.96	.10
NAVICULA CRYPTOCEPHALA VAR. VENETA	51.59	74.79	49.28	58.55	14.11	1.75
NAVICULA NOTHA	.00	18.70	.00	6.23	10.79	.19
NAVICULA PELLICULOSA	.00	37.39	.00	12.46	21.59	.37
NAVICULA PUPULA VAR. RECTANGULARIS	.00	18.70	.00	6.23	10.79	.19
NAVICULA SECRETA VAR. APICULATA	61.91	37.39	164.26	87.85	67.30	2.62
NAVICULA TRIPUNCTATA VAR. SCHIZONEMO	.00	18.70	.00	6.23	10.79	.19
NAVICULA VIRIOULA VAR. AVENACEA	1114.35	2337.14	2463.92	1971.80	745.27	58.89
NITZSCHIA AMPHIBIA	.00	.00	49.28	16.43	28.45	.49
NITZSCHIA APICULATA	30.95	.00	.00	10.32	17.87	.31
NITZSCHIA DISSIPATA	51.59	130.88	82.13	88.20	39.99	2.63
NITZSCHIA FONTICOLA	10.32	37.39	65.70	37.81	27.70	1.13
NITZSCHIA FRUSTULUM	10.32	56.09	.00	22.14	29.85	.66
NITZSCHIA IGNORATA	.00	18.70	.00	6.23	10.79	.19
NITZSCHIA KUTZINGIANA	.00	.00	16.43	5.48	9.48	.16
NITZSCHIA PALEA	41.27	93.49	82.13	72.30	27.46	2.16
NITZSCHIA SP.	41.27	37.39	82.13	53.60	24.79	1.60
RHOICOSPHENIA CURVATA	92.86	18.70	197.11	102.89	89.63	3.07
SKELETONEMA POTAMOS	41.27	.00	.00	13.76	23.83	.41
SURIRELLA OVATA	51.59	56.09	49.28	52.32	3.46	1.56
SYNEDRA AMPHICEPHALA	20.64	.00	16.43	12.35	10.90	.37
UNIDENTIFIED PENNATE DIATOMS	20.64	74.79	49.28	48.23	27.09	1.44
DIVISION TOTAL	2104.89	3758.12	4172.24	3345.08	1093.81	99.90

```
CHLOROPHYTA

  UNIDENTIFIED FILAMENT                              .00          .00        10.35         3.45         5.98            .10
                                               --------     --------     --------     --------     --------          ------
DIVISION TOTAL                                      .00          .00        10.35         3.45         5.98            .10


                                               --------     --------     --------     --------     --------          ------
TOTAL DENSITY                                   2104.89      3758.12      4182.59      3348.53      1097.74          100.00

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DIVERSITY INDEX CALCULATIONS
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SHANNON INDEX = 1.852
VARIANCE      =  .0009
MAXIMUM INDEX = 3.664
EVENNESS      =  .505
NO OF SPECIES =    39

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SAMPLE STATION: WP02 - MIDDLE
REPLICATES - 3
SUBSTRATE - GLASS SLIOES

SAMPLE DATE - 06-01-82

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                                                                        DENSITY (UNITS/MM2)

  TAXON                                           REP 1        REP 2        REP 3         MEAN         S.O.    % RELATIVE ABUNDANCE
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BACILLARIOPHYTA

  ACHNANTHES LANCEOLATA                             .00        96.30          .00        32.10        55.60             .16
  ACHNANTHES LANCEOLATA VAR. OUBIA               727.32       674.07       543.33       648.24        94.68            3.17
  ACHNANTHES LINEARIS                            207.81       385.19       724.44       439.15       262.51            2.15
  ACHNANTHES MINUTISSIMA                        1142.94      1733.33      2897.78      1924.68       892.93            9.41
  AMPHORA PERPUSILLA                             207.81          .00       724.44       310.75       373.03            1.52
  CALONEIS AMPHISBAENA                              .00       192.59          .00        64.20       111.19             .31
  COCCONEIS PLACENTULA VAR. LINEATA              207.81          .00        90.56        99.45       104.19             .49
  CYCLOTELLA MENEGHINIANA                        415.61        96.30       362.22       291.38       171.04            1.42
  CYMBELLA AFFINIS                                  .00        96.30          .00        32.10        55.60             .16
  CYMBELLA MICROCEPHALA                             .00       192.59          .00        64.20       111.19             .31
  CYMBELLA MINUTA VAR. SILESIACA                 207.81       192.59          .00       133.47       115.84             .65
  FRAGILAREA CONSTRUENS VAR. BINODIS             727.32          .00          .00       242.44       419.92            1.19
  FRAGILARIA VAUCHERIAE                             .00        96.30        90.56        62.28        54.02             .30
  GOMPHONEMA ANGUSTATUM                          103.90          .00          .00        34.63        59.99             .17
  GOMPHONEMA TENELLUM                               .00        96.30          .00        32.10        55.60             .16
  GOMPHONEMA SP.                                    .00        96.30          .00        32.10        55.60             .16
  NAVICULA ARVENSIS                              207.81          .00       181.11       129.64       113.06             .63
  NAVICULA CINCTA                                207.81       192.59       271.67       224.02        41.96            1.10
  NAVICULA CRYPTOCEPHALA VAR. VENETA             207.81       577.78       181.11       322.23       221.71            1.58
  NAVICULA RADIOSA                                  .00       192.59          .00        64.20       111.19             .31
  NAVICULA RHYNCHOCEPHALA                           .00          .00        90.56        30.19        52.28             .15
  NAVICULA SECRETA VAR. APICULATA             519.52     577.78     543.33     546.88      29.29          2.67
  NAVICULA TRIPUNCTATA VAR. SCHIZONEMO        311.71        .00        .00     103.90     179.97           .51
  NAVICULA VIRIDULA VAR. AVENACEA           10494.23   10785.19    9598.89   10292.77     618.28         50.33
  NITZSCHIA ACICULARIS                        207.81     192.59        .00     133.47     115.84           .65
  NITZSCHIA CAPITELLATA                          .00      96.30        .00      32.10      55.60           .16
  NITZSCHIA COMMUNIS                             .00      96.30     181.11      92.47      90.62           .45
  NITZSCHIA DISSIPATA                        1766.36    1348.15    1630.00    1581.50     213.28          7.73
  NITZSCHIA FONTICOLA                         415.61     288.89     362.22     355.57      63.62          1.74
  NITZSCHIA FRUSTULUM                            .00        .00     271.67      90.56     156.85           .44
  NITZSCHIA LINEARIS                             .00        .00     181.11      60.37     104.56           .30
  NITZSCHIA PALEA                                .00     192.59     362.22     184.94     181.23           .90
  NITZSCHIA SP.                               311.71     192.59     905.56     469.95     381.92          2.30
  RHOICOSPHENIA CURVATA                       207.81     577.78     543.33     442.97     204.39          2.17
  SURIRELLA OVATA                             519.52     288.89     181.11     329.84     172.88          1.61
  SYNEDRA AMPHICEPHALA                        103.90        .00     181.11      95.00      90.88           .46
  SYNEDRA DELICATISSIMA                       103.90        .00        .00      34.63      59.99           .17
  UNIDENTIFIED PENNATE DIATOMS                311.71      96.30     633.89     347.30     270.56          1.70
                                            --------   --------   --------   --------   --------        ------
DIVISION TOTAL                              19845.53   19644.44   21733.33   20407.77    1152.37         99.78


CHLOROPHYTA

  UNIDENTIFIED GREEN COCCOID                     .00      44.44        .00      14.81      25.66           .07
                                            --------   --------   --------   --------   --------        ------
DIVISION TOTAL                                   .00      44.44        .00      14.81      25.66           .07


CHRYSOPHYTA

  ANABAENA SP.                                   .00      44.44      44.44      29.63      25.66           .14
                                            --------   --------   --------   --------   --------        ------
DIVISION TOTAL                                   .00      44.44      44.44      29.63      25.66           .14

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TOTAL DENSITY                               19845.53   19733.33   21777.78   20452.21    1149.34        100.00

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DIVERSITY INDEX CALCULATIONS
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SHANNON INDEX = 2.174
VARIANCE      =  .0001
MAXIMUM INDEX = 3.689
EVENNESS      =  .589
NO OF SPECIES =    40

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SAMPLE STATION:  WP03 - HUNTER
REPLICATES - 3
SUBSTRATE - GLASS SLIDES

SAMPLE DATE - 06-01-82
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	DENSITY (UNITS/MM2)					
TAXON	REP 1	REP 2	REP 3	MEAN	S.D.	% RELATIVE ABUNDANCE
BACILLARIOPHYTA						
ACHNANTHES LANCEOLATA VAR. DUBIA	76.22	.00	200.67	92.30	101.29	.63
ACHNANTHES LINEARIS	.00	119.70	133.78	84.49	73.51	.58
ACHNANTHES MINUTISSIMA	533.56	478.80	468.22	493.52	35.07	3.39
AMPHORA OVALIS	.00	59.85	.00	19.95	34.55	.14
AMPHORA PERPUSILLA	76.22	179.55	66.89	107.55	62.52	.74
CALONEIS AMPHISBAENA	.00	.00	66.89	22.30	38.62	.15
COCCONEIS PLACENTULA VAR. LINEATA	.00	59.85	.00	19.95	34.55	.14
CYCLOTELLA MENEGHINIANA	228.67	239.40	133.78	200.61	58.13	1.38
CYMBELLA AFFINIS	.00	59.85	.00	19.95	34.55	.14
CYMBELLA SINUATA	.00	.00	133.78	44.59	77.24	.31
DIATOMA VULGARE	.00	.00	66.89	22.30	38.62	.15
FRAGILARIA VAUCHERIAE	381.11	179.55	.00	186.89	190.66	1.28
GOMPHONEMA OLIVACEUM	152.44	59.85	133.78	115.36	48.97	.79
GOMPHONEMA PARVULUM	76.22	119.70	200.67	132.20	63.16	.91
GOMPHONEMA SUBCLAVATUM	.00	119.70	.00	39.90	69.11	.27
NAVICULA CRYPTOCEPHALA VAR. VENETA	533.56	179.55	602.00	438.37	226.74	3.01
NAVICULA HEUFLERI	.00	59.85	133.78	64.54	67.01	.44
NAVICULA NOTHA	152.44	59.85	.00	70.76	76.81	.49
NAVICULA SECRETA VAR. APICULATA	609.78	239.40	401.33	416.84	185.68	2.86
NAVICULA TRIPUNCTATA VAR. SCHIZONEMO	.00	.00	133.78	44.59	77.24	.31
NAVICULA VIRIDULA VAR. AVENACEA	7622.22	7780.43	6688.89	7363.85	589.86	50.57
NITZSCHIA APICULATA	.00	.00	66.89	22.30	38.62	.15
NITZSCHIA DISSIPATA	457.33	239.40	133.78	276.84	164.99	1.90
NITZSCHIA FONTICOLA	762.22	837.89	267.56	622.56	309.76	4.27
NITZSCHIA FRUSTULUM	152.44	478.80	.00	210.41	244.61	1.44
NITZSCHIA HUNGARICA	.00	119.70	133.78	84.49	73.51	.58
NITZSCHIA LINEARIS	76.22	119.70	.00	65.31	60.59	.45
NITZSCHIA PALEA	1372.00	2154.58	2207.33	1911.31	467.80	13.12
NITZSCHIA SP.	1219.56	179.55	334.44	577.85	561.10	3.97
RHOICOSPHENIA CURVATA	381.11	239.40	200.67	273.73	94.99	1.88
SURIRELLA OVALIS	152.44	.00	66.89	73.11	76.41	.50
SURIRELLA OVATA	76.22	658.34	334.44	356.34	291.68	2.45
SYNEDRA AMPHICEPHALA	76.22	.00	.00	25.41	44.01	.17
SYNEDRA ULNA	.00	.00	66.89	22.30	38.62	.15
THALASSIOSIRA FLUVIATILIS	76.22	.00	.00	25.41	44.01	.17
DIVISION TOTAL	15244.44	15022.22	13377.78	14548.15	1019.64	99.90
CHLOROPHYTA						
UNIDENTIFIED FILAMENT	.00	.00	44.44	14.81	25.66	.10
DIVISION TOTAL	.00	.00	44.44	14.81	25.66	.10
TOTAL DENSITY	15244.44	15022.22	13422.22	14562.96	994.14	100.00

DIVERSITY INDEX CALCULATIONS

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SHANNON INDEX = 2.070
VARIANCE      =  .0002
MAXIMUM INDEX = 3.584
EVENNESS      =  .578
NO OF SPECIES =    36

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PERIPHYTON DENSITY AND SPECIES DIVERSITY ESTIMATES

CATHEDRAL BLUFFS SHALE OIL COMPANY
PICEANCE CREEK

SAMPLE STATION: WPO1 - STEWART
REPLICATES - 3
SUBSTRATE - GLASS SLIDES

SAMPLE DATE - 06-30-82

TAXON	DENSITY (UNITS/MM2) REP 1	REP 2	REP 3	MEAN	S.D.	% RELATIVE ABUNDANCE
BACILLARIOPHYTA						
ACHNANTHES LANCEOLATA VAR. DUBIA	25.20	.00	28.70	17.97	15.66	.23
ACHNANTHES LINEARIS	.00	.00	57.40	19.13	33.14	.24
ACHNANTHES MINUTISSIMA	680.44	668.66	1033.26	794.12	207.19	10.11
AMPHORA PERPUSILLA	50.40	.00	.00	16.80	29.10	.21
COCCONEIS PLACENTULA VAR. LINEATA	.00	238.81	.00	79.60	137.88	1.01
CYCLOTELLA MENEGHINIANA	176.41	.00	57.40	77.94	89.98	.99
DENTICULA ELEGANS	.00	95.52	.00	31.84	55.15	.41
FRAGILARIA VAUCHERIAE	.00	143.28	86.11	76.46	72.13	.97
GOMPHONEMA OLIVACEUM	252.01	764.19	57.40	357.87	365.09	4.56
NAVICULA CRYPTOCEPHALA	25.20	95.52	.00	40.24	49.51	.51
NAVICULA CRYPTOCEPHALA VAR. VENETA	100.81	95.52	258.32	151.55	92.50	1.93
NAVICULA MINUSCULA	50.40	.00	.00	16.80	29.10	.21
NAVICULA MUTICA	25.20	.00	.00	8.40	14.55	.11
NAVICULA SECRETA VAR. APICULATA	252.01	238.81	172.21	221.01	42.77	2.82
NAVICULA VIRIDULA VAR. AVENACEA	2268.12	2817.93	1435.09	2173.71	696.24	27.69
NITZSCHIA ACICULARIS	50.40	191.05	86.11	109.18	73.11	1.39
NITZSCHIA AMPHIBIA	.00	.00	28.70	9.57	16.57	.12
NITZSCHIA APICULATA	.00	191.05	.00	63.68	110.30	.81
NITZSCHIA CAPITELLATA	25.20	.00	86.11	37.10	44.27	.47
NITZSCHIA COMMUNIS	.00	47.76	114.81	54.19	57.67	.69
NITZSCHIA DISSIPATA	151.21	716.42	516.63	461.42	286.62	5.88
NITZSCHIA FONTICOLA	226.81	286.57	430.53	314.64	104.72	4.01
NITZSCHIA FRUSTULUM	151.21	47.76	57.40	85.46	57.15	1.09
NITZSCHIA LINEARIS	100.81	95.52	57.40	84.58	23.68	1.08
NITZSCHIA PALEACEA	25.20	477.62	746.25	416.35	364.41	5.30
NITZSCHIA PALEA	100.81	286.57	86.11	157.83	111.74	2.01
NITZSCHIA SP.	100.81	477.62	373.12	317.18	194.53	4.04
RHOICOSPHENIA CURVATA	504.03	955.23	487.93	649.06	265.27	8.27
RHOPALODIA MUSCULUS	.00	95.52	.00	31.84	55.15	.41
SYNEDRA ACUS	252.01	525.38	172.21	316.53	185.21	4.03
SYNEDRA AMPHICEPHALA	50.40	.00	.00	16.80	29.10	.21
SYNEDRA ULNA	151.21	429.85	200.91	260.66	148.62	3.32
THALASSIOSIRA FLUVIATILIS	50.40	.00	.00	16.80	29.10	.21
UNIDENTIFIED PENNATE DIATOMS	.00	.00	143.51	47.84	82.85	.61
DIVISION TOTAL	5846.70	9982.17	6773.62	7534.17	2170.11	95.96
CHLOROPHYTA						
STIGEOCLONIUM TENUE	.00	213.90	213.90	142.60	123.50	1.82

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DIVISION TOTAL                            .00      213.90      213.90      142.60      123.50        1.82


CHRYSOPHYTA

  ANABAENA SP.                            .00         .00       23.77        7.92       13.72         .10
  OSCILLATORIA TENVIS                     .00      166.37         .00       55.46       96.05         .71
  PHORMIDIUM SP.                          .00      190.14      142.60      110.91       98.95        1.41
                                     --------    --------    --------    --------    --------      ------
DIVISION TOTAL                            .00      356.51      166.37      174.29      178.39        2.22


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TOTAL DENSITY                         5846.70    10552.58     7153.89     7851.06     2429.17      100.00

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DIVERSITY INDEX CALCULATIONS
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SHANNON INDEX • 2.781
VARIANCE      •  .0002
MAXIMUM INDEX • 3.638
EVENNESS      •  .764
NO OF SPECIES •    38

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SAMPLE STATION: WPO2 - MIDDLE
REPLICATES - 3
SUBSTRATE - GLASS SLIDES

SAMPLE DATE - 06-30-82

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                                                       DENSITY (UNITS/MM2)
  TAXON                                 REP 1       REP 2       REP 3        MEAN        S.D.  % RELATIVE ABUNDANCE
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BACILLARIOPHYTA

  ACHNANTHES LANCEOLATA VAR. DUBIA      23.83       12.24      127.81       54.63       63.64        1.71
  ACHNANTHES LINEARIS                   59.59         .00         .00       19.86       34.40         .62
  ACHNANTHES MINUTISSIMA                35.75       36.71       63.90       45.46       15.98        1.42
  AMPHORA PERPUSILLA                    47.67         .00       31.95       26.54       24.29         .83
  COCCONEIS PLACENTULA VAR. LINEATA       .00       12.24       15.98        9.40        8.36         .29
  CYCLOTELLA MENEGHINIANA               95.34       85.66       47.93       76.31       25.05        2.39
  CYMBELLA LAEVIS                         .00       12.24         .00        4.08        7.07         .13
  CYMBELLA MINUTA VAR. SILESIACA          .00         .00       31.95       10.65       18.45         .33
  DENTICULA SP.                           .00       24.47         .00        8.16       14.13         .26
  DIATOMA TENUE VAR. ELONGATUM            .00       12.24         .00        4.08        7.07         .13
  FRAGILAREA CONSTRUENS VAR. BINODIS    11.92         .00         .00        3.97        6.88         .12
  FRAGILARIA CONSTRUENS VAR. VENTER       .00       36.71         .00       12.24       21.20         .38
  FRAGILARIA LEPTOSTAURON                 .00         .00       31.95       10.65       18.45         .33
  FRAGILARIA VAUCHERIAE                   .00       73.42       63.90       45.78       39.93        1.43
  GOMPHONEMA OLIVACEUM                  11.92         .00         .00        3.97        6.88         .12
  GOMPHONEMA PARVULUM                              .00       12.24        .00        4.08        7.07            .13
  NAVICULA CRYPTOCEPHALA                           .00         .00      15.98        5.33        9.22            .17
  NAVICULA CRYPTOCEPHALA VAR. VENETA            107.26      134.61      79.88      107.25       27.36           3.36
  NAVICULA MUTICA VAR. UNDULATA                    .00         .00      31.95       10.65       18.45            .33
  NAVICULA PUPULA VAR. CAPITATA                    .00         .00      15.98        5.33        9.22            .17
  NAVICULA RHYNCHOCEPHALA                          .00       12.24        .00        4.08        7.07            .13
  NAVICULA SECRETA VAR. APICULATA                95.34      134.61      95.86      108.60       22.52           3.40
  NAVICULA TRIPUNCTATA VAR. SCHIZONEMO             .00       12.24      47.93       20.06       24.90            .63
  NAVICULA VIRIDULA VAR. AVENACEA              1549.26     1395.04    2044.96     1663.09      339.58          52.13
  NITZSCHIA APICULATA                              .00         .00      63.90       21.30       36.90            .67
  NITZSCHIA CAPITELLATA                            .00       12.24      63.90       25.38       33.92            .80
  NITZSCHIA DISSIPATA                            95.34       36.71     159.76       97.27       61.55           3.05
  NITZSCHIA FONTICOLA                            71.50         .00     111.83       61.11       56.64           1.92
  NITZSCHIA FRUSTULUM                           154.93      208.03     255.62      206.19       50.37           6.46
  NITZSCHIA GRACILIS                               .00         .00      15.98        5.33        9.22            .17
  NITZSCHIA HUNGARICA                            11.92       24.47      47.93       28.11       18.28            .88
  NITZSCHIA LINEARIS                             23.83       48.95      15.98       29.59       17.22            .93
  NITZSCHIA PALEACEA                             35.75       73.42      31.95       47.04       22.93           1.47
  NITZSCHIA PALEA                                  .00       24.47      63.90       29.46       32.24            .92
  NITZSCHIA SIGMOIDEA                            35.75       12.24        .00       16.00       18.17            .50
  NITZSCHIA SP.                                  59.59       73.42        .00       44.34       39.02           1.39
  RHOICOSPHENIA CURVATA                         119.17      171.32      63.90      118.13       53.72           3.70
  SURIRELLA OVALIS                               47.67       12.24      31.95       30.62       17.75            .96
  SURIRELLA OVATA                                23.83       36.71     127.81       62.79       56.68           1.97
  SYNEDRA AMPHICEPHALA                           47.67         .00        .00       15.89       27.52            .50
  SYNEDRA ULNA                                     .00         .00      15.98        5.33        9.22            .17
  UNIDENTIFIED PENNATE DIATOMS                   23.83         .00      31.95       18.60       16.61            .58
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DIVISION TOTAL                                 2788.67     2741.14    3850.27     3126.69      627.09          98.01


CHLOROPHYTA

  CHLAMYDOMONAS SP.                              31.69       15.84      31.69       26.41        9.15            .83
  COELASTRUM SP.                                 15.84         .00        .00        5.28        9.15            .17
  UNIDENTIFIED GREEN COCCOID                       .00       15.84        .00        5.28        9.15            .17
                                              --------    --------   --------    --------    --------         ------
DIVISION TOTAL                                   47.53       31.69      31.69       36.97        9.15           1.16


CHRYSOPHYTA

  OSCILLATORIA TENVIS                              .00         .00      15.84        5.28        9.15            .17
  OSCILLATORIA SP.                               15.84         .00        .00        5.28        9.15            .17
  PHORMIDIUM SP.                                 31.69         .00        .00       10.56       18.30            .33
  PHACUS SP.                                       .00       15.84        .00        5.28        9.15            .17
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DIVISION TOTAL                                   47.53       15.84      15.84       26.41       18.30            .83


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TOTAL DENSITY                                  2883.74     2788.67    3897.80     3190.07      614.75         100.00

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DIVERSITY INDEX CALCULATIONS
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SHANNON INDEX . 2.276
VARIANCE      .  .0010
MAXIMUM INDEX . 3.892
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EVENNESS        •  .585
NO OF SPECIES •     49

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SAMPLE STATION:  WPC3 - HUNTER CRK
REPLICATES - 3
SUBSTRATE - GLASS SLIDES

SAMPLE DATE - 06-30-82

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                                                               DENSITY (UNITS/MM2)

 TAXON                                      REP 1       REP 2       REP 3        MEAN        S.D.    % RELATIVE ABUNDANCE
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BACILLARIOPHYTA

  ACHNANTHES LANCEOLATA                       .00       90.17       84.09       58.09       50.40           .45
  ACHNANTHES LANCEOLATA VAR. DUBIA         159.30      180.35       84.09      141.24       50.61          1.09
  ACHNANTHES LINEARIS                         .00         .00       84.09       28.03       48.55           .22
  ACHNANTHES MINUTISSIMA                   531.00      811.56      840.85      727.80      171.06          5.60
  AMPHORA PERPUSILLA                          .00       90.17         .00       30.06       52.06           .23
  COCCONEIS PEDICULUS                       53.10         .00         .00       17.70       30.66           .14
  COCCONEIS PLACENTULA VAR. LINEATA        265.50         .00         .00       88.50      153.29           .68
  CYCLOTELLA MENEGHINIANA                  159.30      315.60       42.04      172.32      137.24          1.33
  CYMBELLA MINUTA VAR. SILESIACA           106.20         .00         .00       35.40       61.32           .27
  FRAGILARIA VAUCHERIAE                       .00         .00       42.04       14.01       24.27           .11
  GOMPHONEMA ANGUSTATUM                       .00       90.17         .00       30.06       52.06           .23
  GOMPHONEMA PARVULUM                      106.20       90.17         .00       65.46       57.25           .50
  GOMPHONEMA SUBCLAVATUM                      .00         .00       84.09       28.03       48.55           .22
  GOMPHONEMA SP.                            53.10         .00         .00       17.70       30.66           .14
  NAVICULA ARVENSIS                        159.30         .00      126.13       95.14       84.05           .73
  NAVICULA CRYPTOCEPHALA VAR. VENETA          .00      270.52         .00       90.17      156.18           .69
  NAVICULA HEUFLERI                           .00       90.17         .00       30.06       52.06           .23
  NAVICULA LUZONENSIS                       53.10         .00       84.09       45.73       42.52           .35
  NAVICULA MINIMA                             .00         .00       84.09       28.03       48.55           .22
  NAVICULA SECRETA VAR. APICULATA         1008.91      450.86      252.26      570.68      392.30          4.39
  NAVICULA VIRIDULA VAR. AVENACEA         3345.33     2795.36     4036.08     3392.26      621.69         26.09
  NITZSCHIA APICULATA                      318.60      676.30      588.60      527.83      186.43          4.06
  NITZSCHIA DISSIPATA                      424.80      360.69         .00      261.83      229.01          2.01
  NITZSCHIA FONTICOLA                      265.50      586.12      294.30      381.97      177.38          2.94
  NITZSCHIA FRUSTULUM                     4832.14     4643.90     2942.98     4139.67     1040.63         31.84
  NITZSCHIA HUNGARICA                      159.30      495.95      168.17      274.47      191.86          2.11
  NITZSCHIA LINEARIS                          .00      225.43      210.21      145.21      125.99          1.12
  NITZSCHIA PALEACEA                       106.20         .00         .00       35.40       61.32           .27
  NITZSCHIA PALEA                          849.61       90.17         .00      313.26      466.67          2.41
  NITZSCHIA SIGMOIDEA                         .00         .00       42.04       14.01       24.27           .11
  NITZSCHIA TRYBLIONELLA VAR. LEVIOENS        .00         .00       84.09       28.03       48.55           .22
  PINNULARIA SP.                              .00         .00       84.09       28.03       48.55           .22
  RHOICOSPHENIA CURVATA                    531.00      135.26       84.09      250.12      244.60          1.92
  RHOPALODIA GIBBA VAR. VENTRICOSA            .00         .00       84.09       28.03       48.55           .22
  SURIRELLA OVALIS                         318.60      495.95      420.43      411.66       89.00          3.17
  SURIRELLA OVATA                          106.20      450.86      252.26      269.77      173.00          2.08
  SYNEDRA DELICATISSIMA                       .00       45.09         .00       15.03       26.03           .12
  THALASSIOSIRA FLUVIATILIS                265.50       90.17         .00      118.56      135.01           .91
  UNIDENTIFIED PENNATE DIATOMS             106.20         .00         .00       35.40       61.32           .27
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DIVISION TOTAL                         14284.02   13571.00   11099.23   12984.75    1671.37      99.88


CYANOPHYTA

  OSCILLATORIA TENVIS                       .00      23.77      23.77      15.84      13.72        .12
                                      ---------  ---------  ---------  ---------  ---------     ------
DIVISION TOTAL                              .00      23.77      23.77      15.84      13.72        .12

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TOTAL DENSITY                          14284.02   13594.77   11122.99   13000.59    1662.17     100.00
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DIVERSITY INDEX CALCULATIONS
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SHANNON INDEX = 2.356
VARIANCE      =  .0002
MAXIMUM INDEX = 3.689
EVENNESS      =  .639
NO OF SPECIES =    40

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PERIPHYTON DENSITY AND SPECIES DIVERSITY ESTIMATES

CATHEDRAL BLUFFS SHALE OIL COMPANY
PICEANCE CREEK

SAMPLE STATION: WP01 - STEWART
REPLICATES - 3
SUBSTRATE - GLASS SLIDES

SAMPLE DATE - 07-29-82

	DENSITY (UNITS/MM2)					
TAXON	REP 1	REP 2	REP 3	MEAN	S.D.	% RELATIVE ABUNDANCE
BACILLARIOPHYTA						
ACHNANTHES LANCEOLATA VAR. DUBIA	410.61	367.68	199.81	326.03	111.40	4.88
ACHNANTHES LINEARIS	.00	43.26	49.95	31.07	27.11	.47
ACHNANTHES MINUTISSIMA	246.36	281.16	249.77	259.10	19.19	3.88
AMPHORA PERPUSILLA	41.06	.00	124.88	55.31	63.65	.83
COCCONEIS PEDICULUS	20.53	.00	.00	6.84	11.85	.10
COCCONEIS PLACENTULA VAR. LINEATA	554.32	216.28	324.70	365.10	172.60	5.47
CYCLOTELLA MENEGHINIANA	82.12	108.14	49.95	80.07	29.15	1.20
CYMBELLA SINUATA	.00	.00	49.95	16.65	28.84	.25
DIATOMA VULGARE	143.71	129.77	74.93	116.14	36.36	1.74
FRAGILARIA CONSTRUENS VAR. BINODIS	.00	.00	74.93	24.98	43.26	.37
FRAGILARIA CONSTRUENS VAR. VENTER	20.53	.00	.00	6.84	11.85	.10
FRAGILARIA VAUCHERIAE	164.24	108.14	149.86	140.75	29.14	2.11
GOMPHONEMA OLIVACEUM	143.71	216.28	124.88	161.63	48.26	2.42
GOMPHONEMA PARVULUM	41.06	43.26	.00	28.11	24.36	.42
HANTZSCHIA AMPHIOXYS	.00	21.63	.00	7.21	12.49	.11
NAVICULA CRYPTOCEPHALA	41.06	.00	.00	13.69	23.71	.20
NAVICULA CRYPTOCEPHALA VAR. VENETA	20.53	194.65	424.60	213.26	202.68	3.19
NAVICULA MINIMA	41.06	.00	49.95	30.34	26.65	.45
NAVICULA NOTHA	.00	.00	49.95	16.65	28.84	.25
NAVICULA SECRETA VAR. APICULATA	.00	216.28	124.88	113.72	108.57	1.70
NAVICULA TRIPUNCTATA VAR. SCHIZONEMO	20.53	.00	49.95	23.49	25.11	.35
NAVICULA VIRIDULA VAR. AVENACEA	615.91	1211.17	724.32	850.47	317.05	12.73
NAVICULA SP.	20.53	.00	.00	6.84	11.85	.10
NITZSCHIA APICULATA	41.06	151.40	24.98	72.48	68.82	1.09
NITZSCHIA CAPITELLATA	20.53	43.26	74.93	46.24	27.32	.69
NITZSCHIA COMMUNIS	20.53	.00	.00	6.84	11.85	.10
NITZSCHIA DISSIPATA	205.30	410.93	124.88	247.04	147.52	3.70
NITZSCHIA FONTICOLA	246.36	43.26	324.70	204.77	145.26	3.07
NITZSCHIA FRUSTULUM	143.71	21.63	124.88	96.74	65.73	1.45
NITZSCHIA HUNGARICA	.00	.00	24.98	8.33	14.42	.12
NITZSCHIA PALEACEA	41.06	43.26	49.95	44.76	4.63	.67
NITZSCHIA PALEA	205.30	346.05	124.88	225.41	111.95	3.38
NITZSCHIA SIGMOIDEA	.00	.00	49.95	16.65	28.84	.25
NITZSCHIA SP.	.00	173.02	74.93	82.65	86.77	1.24
RHOICOSPHENIA CURVATA	1129.17	1297.68	1323.76	1250.20	105.63	18.72
RHOPALODIA MUSCULUS	.00	21.63	.00	7.21	12.49	.11
STEPHANODISCUS SP.	41.06	.00	.00	13.69	23.71	.20
SURIRELLA OVATA	.00	.00	24.98	8.33	14.42	.12
SYNEDRA ACUS	41.06	.00	74.93	38.66	37.52	.58
SYNEDRA AMPHICEPHALA	.00	86.51	.00	28.84	49.95	.43
SYNEDRA DELICATISSIMA	266.89	432.56	224.79	308.08	109.84	4.61
SYNEDRA ULNA	164.24	346.05	299.72	270.00	94.48	4.04
THALASSIOSIRA FLUVIATILIS	.00	86.51	24.98	37.16	44.52	.56

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  UNIDENTIFIED PENNATE DIATOMS                   82.12       .00       .00      27.37      47.41          .41
                                              --------   --------  --------   --------   --------      ------
DIVISION TOTAL                                 5276.29   6661.44   5869.52    5935.75     694.94        88.88


CHLOROPHYTA

  CHLAMYDOMONAS SP.                                .00       .00     69.88      23.29      40.34          .35
  MOUGEOTIA SP.                                    .00     46.58    163.04      69.88      83.98         1.05
  OEDOGONIUM SP.                                 47.53       .00       .00      15.84      27.44          .24
  STIGEOCLONIUM TENUE                           617.94    628.88    395.96     547.59     131.43         8.20
  TETRAEDRON MINIMUM                             23.77       .00       .00       7.92      13.72          .12
                                              --------   --------  --------   --------   --------      ------
DIVISION TOTAL                                  689.25    675.46    628.88     664.53      31.63         9.95


CHRYSOPHYTA

  ANABAENA SP.                                     .00       .00     23.29       7.76      13.45          .12
  LYNGBYA SP.                                      .00     46.58       .00      15.53      26.89          .23
  OSCILLATORIA TENVIS                              .00       .00     23.29       7.76      13.45          .12
  OSCILLATORIA SP.                                 .00       .00     46.58      15.53      26.89          .23
  PHORMIDIUM SP.                                 71.30       .00       .00      23.77      41.17          .36
  PHACUS SP.                                       .00     23.29       .00       7.76      13.45          .12
                                              --------   --------  --------   --------   --------      ------
DIVISION TOTAL                                   71.30     69.88     93.17      78.11      13.06         1.17

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TOTAL DENSITY                                  6036.84   7406.77   6591.56    6678.39     689.08       100.00
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DIVERSITY INDEX CALCULATIONS
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SHANNON INDEX = 3.085
VARIANCE      =  .0002
MAXIMUM INDEX = 4.007
EVENNESS      =  .770
NO OF SPECIES =    55
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SAMPLE STATION:  WP02 - MIDDLE
REPLICATES - 3
SUBSTRATE - GLASS SLIDES

SAMPLE DATE - 07-29-82
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                                                           DENSITY (UNITS/MM2)
  TAXON                                          REP 1     REP 2     REP 3       MEAN       S.D.   % RELATIVE ABUNDANCE
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BACILLARIOPHYTA

BACILLARIOPHYTA	.00	19.14	.00	6.38	11.05	.21
ACHNANTHES LANCEOLATA	11.07	.00	.00	3.69	6.39	.12
ACHNANTHES LANCEOLATA VAR. DUBIA	132.80	382.87	92.79	202.82	157.21	6.81
ACHNANTHES LINEARIS	22.13	.00	7.14	9.76	11.30	.33
ACHNANTHES MINUTISSIMA	44.27	220.15	46.40	103.60	100.94	3.48
AMPHORA PERPUSILLA	44.27	.00	10.71	18.32	23.10	.61
CALONEIS SP.	.00	19.14	.00	6.38	11.05	.21
COCCONEIS PLACENTULA VAR. LINEATA	188.13	181.86	74.95	148.31	63.61	4.98
CYCLOTELLA MENEGHINIANA	66.40	47.86	10.71	41.65	28.36	1.40
CYMBELLA MINUTA VAR. SILESIACA	11.07	.00	.00	3.69	6.39	.12
CYMBELLA SINUATA	.00	19.14	.00	6.38	11.05	.21
DIATOMA VULGARE	77.46	.00	.00	25.82	44.72	.87
FRAGILAREA CONSTRUENS VAR. BINODIS	.00	.00	21.41	7.14	12.36	.24
FRAGILARIA VAUCHERIAE	77.46	153.15	14.28	81.63	69.53	2.74
GOMPHONEMA OLIVACEUM	55.33	143.58	28.55	75.82	60.19	2.54
GOMPHONEMA PARVULUM	33.20	210.58	74.95	106.24	92.74	3.56
GOMPHONEMA SUBCLAVATUM	.00	.00	10.71	3.57	6.18	.12
HANTZSCHIA AMPHIOXYS	22.13	.00	.00	7.38	12.78	.25
NAVICULA CRYPTOCEPHALA VAR. VENETA	166.00	67.00	17.84	83.61	75.46	2.81
NAVICULA MINIMA	44.27	9.57	7.14	20.33	20.77	.68
NAVICULA NOTHA	22.13	.00	3.57	8.57	11.88	.29
NAVICULA SECRETA VAR. APICULATA	44.27	.00	21.41	21.89	22.14	.73
NAVICULA TRIPUNCTATA VAR. SCHIZONEMO	22.13	.00	.00	7.38	12.78	.25
NAVICULA VIRIDULA VAR. AVENACEA	675.05	239.29	60.67	325.00	316.03	10.91
NITZSCHIA APICULATA	.00	.00	7.14	2.38	4.12	.08
NITZSCHIA CAPITELLATA	22.13	.00	.00	7.38	12.78	.25
NITZSCHIA COMMUNIS	22.13	19.14	.00	13.76	12.01	.46
NITZSCHIA DISSIPATA	243.46	47.86	32.12	107.81	117.74	3.62
NITZSCHIA FONTICOLA	154.93	181.86	24.98	120.59	83.89	4.05
NITZSCHIA FRUSTULUM	11.07	95.72	32.12	46.30	44.07	1.55
NITZSCHIA LINEARIS	.00	.00	3.57	1.19	2.06	.04
NITZSCHIA PALEACEA	11.07	19.14	14.28	14.83	4.07	.50
NITZSCHIA PALEA	55.33	57.43	21.41	44.73	20.22	1.50
NITZSCHIA SP.	55.33	.00	.00	18.44	31.95	.62
RHOICOSPHENIA CURVATA	531.19	478.59	203.43	404.40	176.02	13.57
RHOPALODIA MUSCULUS	22.13	.00	.00	7.38	12.78	.25
SURIRELLA OVATA	11.07	19.14	3.57	11.26	7.79	.38
SYNEDRA DELICATISSIMA	166.00	57.43	.00	74.48	84.30	2.50
SYNEDRA FASCICULATA VAR. TRUNCATA	.00	.00	3.57	1.19	2.06	.04
SYNEDRA ULNA	77.46	67.00	10.71	51.72	35.91	1.74
THALASSIOSIRA FLUVIATILIS	.00	9.57	.00	3.19	5.53	.11
UNIDENTIFIED PENNATE DIATOMS	.00	38.29	24.98	21.09	19.44	.71
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DIVISION TOTAL	3142.86	2804.52	885.09	2277.49	1217.66	76.42

CHLOROPHYTA

ANKISTRODESMUS SP.	47.62	.00	23.29	23.64	23.81	.79
CHLAMYDOMONAS SP.	47.62	47.53	.00	31.72	27.47	1.06
MOUGEOTIA SP.	47.62	47.53	.00	31.72	27.47	1.06
STIGEOCLONIUM TENUE	690.48	689.25	395.96	591.89	169.69	19.86
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DIVISION TOTAL	833.33	784.31	419.25	678.97	226.25	22.78

CHRYSOPHYTA

OSCILLATORIA SP.	23.81	.00	.00	7.94	13.75	.27
PHORMIDIUM SP.	.00	23.77	.00	7.92	13.72	.27

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  TRACHELEMONAS SP.                        23.81       .00       .00      7.94     13.75        .27
                                         --------  --------  --------  --------  --------     ------
DIVISION TOTAL                             47.62     23.77       .00     23.80     23.81        .80


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TOTAL DENSITY                            4023.81   3612.60   1304.34   2980.25   1465.87     100.00

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DIVERSITY INDEX CALCULATIONS
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SHANNON INDEX = 2.950
VARIANCE      =  .0005
MAXIMUM INDEX = 3.892
EVENNESS      =  .758
NO OF SPECIES =    49

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PERIPHYTON DENSITY AND SPECIES DIVERSITY ESTIMATES

CATHEDRAL BLUFFS SHALE OIL COMPANY
PICEANCE CREEK

SAMPLE STATION: WP01 - STEWART
REPLICATES - 3
SUBSTRATE - GLASS SLIDES

SAMPLE DATE - 09-02-82

TAXON	DENSITY (UNITS/MM2) REP 1	REP 2	REP 3	MEAN	S.D.	% RELATIVE ABUNDANCE
BACILLARIOPHYTA						
ACHNANTHES LANCEOLATA VAR. DUBIA	65.79	95.02	33.90	64.90	30.57	.49
ACHNANTHES LINEARIS	65.79	126.70	169.49	120.66	52.11	.91
ACHNANTHES MINUTISSIMA	504.41	1013.58	576.28	698.09	275.58	5.26
AMPHORA PERPUSILLA	153.52	95.02	440.68	229.74	185.01	1.73
COCCONEIS PEDICULUS	.00	.00	33.90	11.30	19.57	.09
COCCONEIS PLACENTULA VAR. LINEATA	87.72	285.07	203.39	192.06	99.16	1.45
CYCLOTELLA MENEGHINIANA	.00	95.02	33.90	42.97	48.16	.32
CYMBELLA AFFINIS	43.86	126.70	.00	56.85	64.34	.43
CYMBELLA MINUTA VAR. SILESIACA	87.72	31.67	.00	39.80	44.42	.30
CYMBELLA SINUATA	.00	.00	67.80	22.60	39.14	.17
FRAGILARIA VAUCHERIAE	87.72	95.02	271.19	151.31	103.88	1.14
GOMPHONEMA OLIVACEUM	175.45	411.77	305.09	297.43	118.35	2.24
GOMPHONEMA PARVULUM	175.45	158.37	.00	111.27	96.74	.84
GOMPHONEMA TENELLUM	.00	.00	33.90	11.30	19.57	.09
GOMPHONEMA SP.	43.86	31.67	.00	25.18	22.64	.19
NAVICULA ARVENSIS	87.72	63.35	203.39	118.15	74.82	.89
NAVICULA CRYPTOCEPHALA	21.93	506.79	.00	176.24	286.47	1.33
NAVICULA CRYPTOCEPHALA VAR. VENETA	833.37	1773.76	610.17	1072.43	617.53	8.08
NAVICULA HEUFLERI	482.48	791.86	237.29	503.87	277.90	3.80
NAVICULA MINIMA	.00	95.02	169.49	88.17	84.95	.66
NAVICULA MUTICA	43.86	.00	.00	14.62	25.32	.11
NAVICULA PELLICULOSA	43.86	.00	.00	14.62	25.32	.11
NAVICULA SALINARUM VAR. INTERMEDIA	43.86	.00	.00	14.62	25.32	.11
NAVICULA SECRETA VAR. APICULATA	548.27	570.14	203.39	440.60	205.72	3.32
NAVICULA TRIPUNCTATA VAR. SCHIZONEMO	.00	63.35	.00	21.12	36.57	.16
NAVICULA VIRIDULA VAR. AVENACEA	2193.08	3167.43	3389.86	2916.79	636.54	21.97
NITZSCHIA AMPHIBIA	.00	31.67	.00	10.56	18.29	.08
NITZSCHIA APICULATA	65.79	95.02	33.90	64.90	30.57	.49
NITZSCHIA DENTICULA	.00	.00	33.90	11.30	19.57	.09
NITZSCHIA DISSIPATA	1798.32	2438.92	1322.04	1853.10	560.45	13.96
NITZSCHIA FONTICOLA	482.48	506.79	101.70	363.65	227.19	2.74
NITZSCHIA FRUSTULUM	635.99	2248.87	1389.84	1424.90	807.01	10.73
NITZSCHIA HUNGARICA	65.79	.00	.00	21.93	37.99	.17
NITZSCHIA IGNORATA	.00	31.67	.00	10.56	18.29	.08
NITZSCHIA PALEA	65.79	380.09	33.90	159.93	191.33	1.20
NITZSCHIA SP.	109.65	63.35	.00	57.67	55.05	.43
RHOICOSPHENIA CURVATA	767.58	981.90	576.28	775.25	202.92	5.84
SURIRELLA OVATA	21.93	31.67	.00	17.87	16.22	.13
SYNEDRA ACUS	.00	.00	33.90	11.30	19.57	.09
SYNEDRA MINUSCULA	43.86	.00	.00	14.62	25.32	.11
SYNEDRA ULNA	.00	.00	33.90	11.30	19.57	.09
UNIDENTIFIED PENNATE DIATOMS	87.72	158.37	.00	82.03	79.34	.62

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DIVISION TOTAL                            9934.64     16565.66     10542.45     12347.58      3665.58         93.02


CHLOROPHYTA

  STIGEOCLONIUM TENUE                      190.14       784.31       879.38       617.94       373.53          4.66
  UNIDENTIFIED FILAMENT                       .00        23.77          .00         7.92        13.72           .06
                                         --------     --------     --------     --------     --------        ------
DIVISION TOTAL                             190.14       808.08       879.38       625.87       379.03          4.71


CHRYSOPHYTA

  CHROOCOCCUS SP.                           47.53          .00          .00        15.84        27.44           .12
  LYNGBYA SP.                              261.44       261.44       308.97       277.28        27.44          2.09
  PHORMIDIUM SP.                              .00          .00        23.77         7.92        13.72           .06
                                         --------     --------     --------     --------     --------        ------
DIVISION TOTAL                             308.97       261.44       332.74       301.05        36.30          2.27


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TOTAL DENSITY                            10433.75     17635.18     11754.57     13274.50      3833.77        100.00

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DIVERSITY INDEX CALCULATIONS
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SHANNON INDEX = 2.774
VARIANCE      =  .0001
MAXIMUM INDEX = 3.850
EVENNESS      =  .721
NO OF SPECIES =    47

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SAMPLE STATION:  WPO2 - MIDDLE
REPLICATES - 3
SUBSTRATE - GLASS SLIDES

SAMPLE DATE - 07-02-82

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                                                               DENSITY (UNITS/MM2)

  TAXON                                     REP 1        REP 2        REP 3         MEAN         S.D.   % RELATIVE ABUNDANCE
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BACILLARIOPHYTA

  ACHNANTHES LANCEOLATA VAR. DUBIA         106.88        50.51        74.57        77.32        28.29           .91
  ACHNANTHES LINEARIS                       30.54        50.51          .00        27.01        25.44           .32
  ACHNANTHES MINUTISSIMA                   213.77       631.31       410.15       418.41       208.90          4.92
  AMPHORA OVALIS                            30.54          .00          .00        10.18        17.63           .12
  AMPHORA OVALIS VAR. AFFINIS                 .00        50.51          .00        16.84        29.16           .20
  AMPHORA PERPUSILLA                       229.03       328.28       149.15       235.49        89.74          2.77
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COCCONEIS PLACENTULA VAR. EUGLYPTA	.00	50.51	.00	16.84	29.16	.20
COCCONEIS PLACENTULA VAR. LINEATA	167.96	353.54	447.44	322.98	142.22	3.80
CYCLOTELLA MENEGHINIANA	15.27	50.51	74.57	46.78	29.83	.55
CYMBELLA AFFINIS	.00	25.25	149.15	58.13	79.83	.68
CYMBELLA CYMBIFORMIS	.00	50.51	.00	16.84	29.16	.20
CYMBELLA MINUTA VAR. SILESIACA	.00	25.25	.00	8.42	14.58	.10
CYMBELLA SINUATA	15.27	126.26	37.29	59.61	58.77	.70
DIATOMA TENUE VAR. ELONGATUM	.00	50.51	111.86	54.12	56.02	.64
FRAGILARIA LEPTOSTAURON	.00	25.25	.00	8.42	14.58	.10
FRAGILARIA VAUCHERIAE	152.69	75.76	74.57	101.01	44.76	1.19
GOMPHONEMA OLIVACEUM	106.88	75.76	37.29	73.31	34.86	.86
GOMPHONEMA PARVULUM	.00	126.26	111.86	79.37	69.12	.93
GOMPHONEMA SP.	15.27	.00	.00	5.09	8.82	.06
NAVICULA ARVENSIS	30.54	101.01	74.57	68.71	35.60	.81
NAVICULA CRYPTOCEPHALA VAR. VENETA	458.07	959.60	559.30	658.99	265.21	7.75
NAVICULA HEUFLERI	351.19	681.82	857.60	630.20	257.12	7.41
NAVICULA MINIMA	.00	176.77	.00	58.92	102.06	.69
NAVICULA MUTICA VAR. UNDULATA	.00	50.51	.00	16.84	29.16	.20
NAVICULA NOTHA	.00	.00	74.57	24.86	43.06	.29
NAVICULA SALINARUM VAR. INTERMEOIA	91.61	50.51	111.86	84.66	31.26	1.00
NAVICULA SECRETA VAR. APICULATA	122.15	303.03	149.15	191.44	97.58	2.25
NAVICULA TRIPUNCTATA VAR. SCHIZONEMO	.00	50.51	.00	16.84	29.16	.20
NAVICULA VIRIOULA VAR. AVENACEA	1526.90	2525.25	3765.96	2606.04	1121.72	30.63
NAVICULA SP.	30.54	25.25	.00	18.60	16.32	.22
NITZSCHIA APICULATA	30.54	101.01	37.29	56.28	38.89	.66
NITZSCHIA OISSIPATA	183.23	631.31	596.59	470.38	249.28	5.53
NITZSCHIA FONTICOLA	76.34	25.25	74.57	58.72	29.00	.69
NITZSCHIA FRUSTULUM	488.61	707.07	932.17	709.28	221.79	8.34
NITZSCHIA PALEA	76.34	25.25	111.86	71.15	43.54	.84
NITZSCHIA TRYBLIONELLA VAR. LEVIOENS	15.27	.00	.00	5.09	8.82	.06
NITZSCHIA SP.	.00	50.51	.00	16.84	29.16	.20
RHOICOSPHENIA CURVATA	396.99	732.32	1155.89	761.74	380.30	8.95
SURIRELLA OVATA	30.54	126.26	74.57	77.12	47.91	.91
SYNEDRA DELICATISSIMA	15.27	.00	37.29	17.52	18.74	.21
SYNEDRA FASCICULATA	15.27	25.25	.00	13.51	12.72	.16
SYNEDRA MINUSCULA	183.23	50.51	.00	77.91	94.64	.92
SYNEDRA SP.	15.27	.00	.00	5.09	8.82	.06
THALASSIOSIRA FLUVIATILIS	15.27	.00	.00	5.09	8.82	.06
UNIOLNTIFIED PENNATE OIATOMS	15.27	75.76	.00	30.34	40.07	.36
DIVISION TOTAL	5252.53	9621.21	10291.15	8388.29	2736.24	98.60
CHLOROPHYTA						
STIGEOCLONIUM TENUE	23.77	95.07	142.60	87.15	59.81	1.02
DIVISION TOTAL	23.77	95.07	142.60	87.15	59.81	1.02
CHRYSOPHYTA						
LYNGBYA SP.	23.77	.00	47.53	23.77	23.77	.28
OSCILLATORIA TENVIS	23.77	.00	.00	7.92	13.72	.09
OIVISION TOTAL	47.53	.00	47.53	31.69	27.44	.37
TOTAL DENSITY	5323.83	9716.28	10481.28	8507.13	2783.23	100.00

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DIVERSITY INDEX CALCULATIONS
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SHANNON INDEX • 2.691
VARIANCE      =  .0002
MAXIMUM INDEX • 3.871
EVENNESS      =  .695
NO OF SPECIES •    48

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SAMPLE STATION:  WPO3 - HUNTER
REPLICATES - 3
SUBSTRATE - GLASS SLIDES

SAMPLE DATE - 09-02-82

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                                                                  DENSITY (UNITS/MM2)
  TAXON                                         REP 1      REP 2      REP 3       MEAN       S.D.   % RELATIVE ABUNDANCE
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BACILLARIOPHYTA

  ACHNANTHES LANCEOLATA VAR. DUBIA              12.92        .00        .00       4.31       7.46            .41
  COCCONEIS PLACENTULA VAR. EUGLYPTA              .00       6.61        .00       2.20       3.82            .21
  COCCONEIS PLACENTULA VAR. LINEATA            710.57     667.76     968.29     782.21     162.57          74.42
  CYMBELLA AFFINIS                                .00      13.22        .00       4.41       7.63            .42
  DIATOMA VULGARE                                6.46        .00        .00       2.15       3.73            .20
  GOMPHONEMA INTRICATUM                           .00       6.61        .00       2.20       3.82            .21
  GOMPHONEMA OLIVACEUM                          12.92      46.28      87.15      48.78      37.18           4.64
  GOMPHONEMA PARVULUM                            6.46      13.22        .00       6.56       6.61            .62
  GOMPHONEMA SUBCLAVATUM                          .00       6.61        .00       2.20       3.82            .21
  GOMPHONEMA TENELLUM                             .00        .00      19.37       6.46      11.18            .61
  NAVICULA CRYPTOCEPHALA VAR. VENETA              .00      13.22        .00       4.41       7.63            .42
  NAVICULA HEUFLERI                              6.46      26.45      19.37      17.42      10.13           1.66
  NAVICULA SECRETA VAR. APICULATA                 .00        .00      19.37       6.46      11.18            .61
  NAVICULA VIRIDULA VAR. AVENACEA                 .00        .00      29.05       9.68      16.77            .92
  NITZSCHIA APICULATA                             .00      26.45        .00       8.82      15.27            .84
  NITZSCHIA DISSIPATA                             .00        .00      29.05       9.68      16.77            .92
  NITZSCHIA FONTICOLA                           25.84      13.22      19.37      19.48       6.31           1.85
  NITZSCHIA FRUSTULUM                           51.68      52.89      29.05      44.54      13.43           4.24
  RHOICOSPHENIA CURVATA                          6.46      26.45        .00      10.97      13.79           1.04
                                             --------   --------   --------   --------   --------         ------
DIVISION TOTAL                                 839.77     918.99    1220.04     992.94     200.63          94.47


CHLOROPHYTA

  CHLAMYDOMONAS SP.                               .00       7.92        .00       2.64       4.57            .25
  OEDOGONIUM SP.                                79.22        .00      15.84      31.69      41.92           3.02
  STIGEOCLONIUM TENUE                             .00        .00      31.69      10.56      18.30           1.01
                                             --------   --------   --------   --------   --------         ------
DIVISION TOTAL                                  79.22       7.92      47.53      44.89      35.72           4.27
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CHRYSOPHYTA

  ANABAENA SP.                               .00      15.84        .00       5.28       9.15          .50
  CHROOCOCCUS SP.                          15.84        .00        .00       5.28       9.15          .50
  LYNGBYA SP.                               7.92        .00        .00       2.64       4.57          .25
                                        --------   --------   --------   --------   --------       ------
DIVISION TOTAL                             23.77      15.84        .00      13.20      12.10         1.26


                                        --------   --------   --------   --------   --------       ------
TOTAL DENSITY                             942.76     942.76    1267.58    1051.03     187.53       100.00
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DIVERSITY INDEX CALCULATIONS
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SHANNON INDEX = 1.262
VARIANCE      =  .0028
MAXIMUM INDEX = 3.219
EVENNESS      =  .392
NO OF SPECIES =    25
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PERIPHYTON DENSITY AND SPECIES DIVERSITY ESTIMATES

CATHEDRAL BLUFFS SHALE OIL COMPANY
PICEANCE CREEK

SAMPLE STATION: WP01 - STEWART
REPLICATES - 3
SUBSTRATE - GLASS SLIDES

SAMPLE DATE - 10-04-82

	DENSITY (UNITS/MM2)					
TAXON	REP 1	REP 2	REP 3	MEAN	S.D.	% RELATIVE ABUNDANCE
BACILLARIOPHYTA						
ACHNANTHES LANCEOLATA VAR. DUBIA	26.09	54.32	52.41	44.27	15.78	.51
ACHNANTHES MINUTISSIMA	1487.00	2064.34	2646.68	2066.01	579.84	23.73
AMPHORA PERPUSILLA	234.79	108.65	131.02	158.15	67.30	1.82
COCCONEIS PLACENTULA VAR. LINEATA	104.35	135.81	52.41	97.52	42.12	1.12
CYCLOTELLA MENEGHINIANA	26.09	.00	.00	8.70	15.06	.10
CYMBELLA AFFINIS	26.09	.00	.00	8.70	15.06	.10
CYMBELLA SINUATA	.00	27.16	.00	9.05	15.68	.10
FRAGILARIA VAUCHERIAE	26.09	.00	183.43	69.84	99.24	.80
GOMPHONEMA OLIVACEUM	26.09	81.49	78.61	62.06	31.19	.71
GOMPHONEMA PARVULUM	182.61	81.49	314.46	192.85	116.82	2.21
GOMPHONEMA TENELLUM	.00	.00	52.41	17.47	30.26	.20
GOMPHONEMA SP.	.00	.00	26.20	8.73	15.13	.10
NAVICULA ARVENSIS	.00	108.65	26.20	44.95	56.70	.52
NAVICULA CRYPTOCEPHALA VAR. VENETA	234.79	597.57	262.05	364.80	202.04	4.19
NAVICULA HEUFLERI	391.32	271.62	288.25	317.06	64.84	3.64
NAVICULA MINIMA	130.44	27.16	26.20	61.27	59.91	.70
NAVICULA NOTHA	130.44	271.62	288.25	230.10	86.71	2.64
NAVICULA SECRETA VAR. APICULATA	234.79	298.79	288.25	273.94	34.31	3.15
NAVICULA TRIPUNCTATA VAR. SCHIZONEMO	.00	27.16	26.20	17.79	15.41	.20
NAVICULA VIRIDULA VAR. AVENACEA	2608.78	2743.40	1624.69	2325.62	610.74	26.71
NITZSCHIA DISSIPATA	1304.39	1385.28	2174.99	1621.55	481.00	18.62
NITZSCHIA FRUSTULUM	391.32	543.25	445.48	460.01	77.00	5.28
NITZSCHIA LINEARIS	.00	.00	26.20	8.73	15.13	.10
NITZSCHIA PALEA	.00	.00	26.20	8.73	15.13	.10
RHOICOSPHENIA CURVATA	156.53	271.62	131.02	186.39	74.91	2.14
SURIRELLA OVATA	26.09	27.16	26.20	26.48	.59	.30
DIVISION TOTAL	7748.07	9126.56	9197.86	8690.83	817.23	99.82
CYANOPHYTA						
OSCILLATORIA TENVIS	47.53	.00	.00	15.84	27.44	.18
DIVISION TOTAL	47.53	.00	.00	15.84	27.44	.18
TOTAL DENSITY	7795.60	9126.56	9197.86	8706.67	789.82	100.00

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DIVERSITY INDEX CALCULATIONS
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SHANNON INDEX • 2.169
VARIANCE      •  .0002
MAXIMUM INDEX = 3.296
EVENNESS      =  .658
NO OF SPECIES =    27

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SAMPLE STATION:  WP02 - MIDDLE
REPLICATES - 3
SUBSTRATE - GLASS SLIDES

SAMPLE DATE - 10-04-82

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                                                                  DENSITY (UNITS/MM2)

 TAXON                                          REP 1        REP 2        REP 3         MEAN         S.D.    % RELATIVE ABUNDANCE
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BACILLARIOPHYTA

 ACHNANTHES LANCEOLATA                            .00        21.91          .00         7.30        12.65           .18
 ACHNANTHES LANCEOLATA VAR. DUBIA               45.82        65.74        87.44        66.33        20.81          1.68
 ACHNANTHES LINEARIS                            15.27          .00          .00         5.09         8.82           .13
 ACHNANTHES MINUTISSIMA                        336.03       482.10       227.33       348.49       127.84          8.82
 AMPHORA PERPUSILLA                            106.92       153.40       104.92       121.75        27.43          3.08
 COCCONEIS PEDICULUS                            15.27          .00          .00         5.09         8.82           .13
 COCCONEIS PLACENTULA VAR. LINEATA             160.38       131.48       139.90       143.92        14.86          3.64
 CYCLOTELLA MENEGHINIANA                        22.91          .00        34.97        19.30        17.77           .49
 CYMBELLA AFFINIS                                7.64          .00          .00         2.55         4.41           .06
 CYMBELLA MINUTA VAR. SILESIACA                 15.27        21.91          .00        12.40        11.24           .31
 CYMBELLA SINUATA                               15.27        21.91          .00        12.40        11.24           .31
 FRAGILAREA CONSTRUENS VAR. BINODIS             38.19          .00          .00        12.73        22.05           .32
 FRAGILARIA CONSTRUENS VAR. VENTER                .00        21.91          .00         7.30        12.65           .18
 FRAGILARIA LEPTOSTAURON                          .00        43.83          .00        14.61        25.30           .37
 FRAGILARIA VAUCHERIAE                          15.27       109.57        34.97        53.27        49.74          1.35
 FRUSTULIA RHOMBOIDES                             .00          .00        34.97        11.66        20.19           .30
 GOMPHONEMA OLIVACEUM                           38.19        43.83          .00        27.34        23.84           .69
 GOMPHONEMA PARVULUM                            84.01        43.83        87.44        71.76        24.25          1.82
 GOMPHONEMA TENELLUM                            15.27          .00          .00         5.09         8.82           .13
 HANTZSCHIA AMPHIOXYS                             .00        21.91          .00         7.30        12.65           .18
 NAVICULA ARVENSIS                              22.91          .00          .00         7.64        13.23           .19
 NAVICULA CRYPTOCEPHALA VAR. VENETA             84.01       175.31       244.82       168.05        80.65          4.25
 NAVICULA HEUFLERI                              91.64       131.48        69.95        97.69        31.21          2.47
 NAVICULA MINIMA                                38.19          .00          .00        12.73        22.05           .32
 NAVICULA MUTICA                                 7.64          .00          .00         2.55         4.41           .06
 NAVICULA MUTICA VAR. UNDULATA                    .00        21.91          .00         7.30        12.65           .18
 NAVICULA ROTHA                                 38.19          .00       104.92        47.70        53.11          1.21
 NAVICULA PUPULA                                  .00        43.83          .00        14.61        25.30           .37
 NAVICULA SALINARUM VAR. INTERMEDIA             45.82          .00        87.44        44.42        43.73          1.12
 NAVICULA SECRETA VAR. APICULATA                91.64       219.14       209.85       173.54        71.08          4.39
 NAVICULA TRIPUNCTATA VAR. SCHIZONEMO           15.27          .00        69.95        28.41        36.78           .72
 NAVICULA VIRIDULA VAR. AVENACEA               763.71      2191.37      1748.72      1567.93       730.80         39.70
 NITZSCHIA AMPHIBIA                              7.64          .00          .00         2.55         4.41           .06
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  CYMBELLA AFFINIS                                .00        .93      2.49      1.14      1.26        .12
  DENTICULA ELEGANS                              8.15        .00      4.14      4.10      4.07        .44
  ENTOMONEIS ORNATA                               .00        .93       .00       .31       .54        .03
  FRAGILAREA CONSTRUENS VAR. BINODIS              .00       6.50       .00      2.17      3.76        .23
  FRAGILARIA LEPTOSTAURON                        4.07       3.72       .00      2.60      2.26        .28
  FRAGILARIA VAUCHERIAE                          8.15        .00      3.31      3.82      4.10        .41
  FRUSTULIA RHOMBOIDES                            .00       1.86       .00       .62      1.07        .07
  GOMPHONEMA OLIVACEUM                          40.74      25.09     16.57     27.47     12.26       2.94
  GOMPHONEMA PARVULUM                           89.64       3.72     24.03     39.13     44.91       4.19
  GOMPHONEMA TENELLUM                           24.45        .93      4.97     10.12     12.57       1.08
  GOMPHONEMA SP.                                  .00       2.79       .00       .93      1.61        .10
  NAVICULA ARVENSIS                             12.22        .00      4.14      5.46      6.22        .58
  NAVICULA CRYPTOCEPHALA VAR. VENETA            57.04       4.65      6.63     22.77     29.69       2.44
  NAVICULA HEUFLERI                             85.56      18.58     15.74     39.96     39.52       4.28
  NAVICULA MINIMA                                8.15       1.86       .00      3.34      4.27        .36
  NAVICULA MUTICA                                 .00       1.86       .00       .62      1.07        .07
  NAVICULA MUTICA VAR. UNDULATA                   .00        .00       .83       .28       .48        .03
  NAVICULA NOTHA                                36.67       7.43      2.49     15.53     18.47       1.66
  NAVICULA PUPULA                                 .00        .00      2.49       .83      1.44        .09
  NAVICULA PUPULA VAR. CAPITATA                   .00        .93       .00       .31       .54        .03
  NAVICULA SALINARUM VAR. INTERMEOIA              .00       2.79       .00       .93      1.61        .10
  NAVICULA SECRETA VAR. APICULATA               77.41       9.29     14.09     33.60     38.02       3.60
  NAVICULA TRIPUNCTATA VAR. SCHIZONEMO           8.15        .00       .00      2.72      4.70        .29
  NAVICULA VIRIDULA VAR. AVENACEA              110.01      92.92     53.86     85.59     28.78       9.17
  NITZSCHIA APICULATA                             .00       6.50       .83      2.44      3.54        .26
  NITZSCHIA DISSIPATA                          256.68      18.58     31.49    102.25    133.90      10.96
  NITZSCHIA FRUSTULUM                          293.35      34.38     40.60    122.78    147.76      13.16
  NITZSCHIA HUNGARICA                             .00        .93       .00       .31       .54        .03
  NITZSCHIA SP.                                   .00       3.72       .00      1.24      2.15        .13
  PINNULARIA BREBISSONII                          .00       2.79       .00       .93      1.61        .10
  RHOICOSPHENIA CURVATA                        101.86      78.98     82.86     87.90     12.24       9.42
  RHOPALODIA MUSCULUS                            8.15       2.79      1.66      4.20      3.47        .45
  STAURONEIS ANICEPS                              .00        .93       .00       .31       .54        .03
  STEPHANODISCUS SP.                              .00        .93      1.66       .86       .83        .09
  SURIRELLA OVATA                                4.07       1.86       .83      2.25      1.66        .24
  SYNEDRA ACUS                                   4.07        .00       .00      1.36      2.35        .15
  SYNEDRA ULNA                                    .00        .93       .00       .31       .54        .03
  THALASSIOSIRA FLUVIATILIS                      8.15        .00       .00      2.72      4.70        .29
  UNIDENTIFIEO PENNATE OIATOMS                    .00       1.86       .00       .62      1.07        .07
                                             --------   --------  --------  --------  --------     ------
DIVISION TOTAL                                1853.83     447.86    430.03    910.57    816.93      97.59


CHLOROPHYTA

  STIGEOCLONIUM TENUE                           35.65      23.77      7.92     22.45     13.91       2.41
                                             --------   --------  --------  --------  --------     ------
DIVISION TOTAL                                  35.65      23.77      7.92     22.45     13.91       2.41


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TOTAL DENSITY                                 1889.48     471.62    437.95    933.02    828.49     100.00

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DIVERSITY INDEX CALCULATIONS
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SHANNON INDEX = 2.709
VARIANCE      =  .0012
MAXIMUM INDEX = 3.829
EVENNESS      =  .707
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  NITZSCHIA DISSIPATA                  351.31    306.79    384.72    347.60     39.09         8.80
  NITZSCHIA FONTICOLA                    7.64       .00       .00      2.55      4.41          .06
  NITZSCHIA FRUSTULUM                  168.02    328.71    384.72    293.81    112.49         7.44
  NITZSCHIA PALEA                         .00     43.83     17.49     20.44     22.06          .52
  NITZSCHIA SP.                           .00       .00     17.49      5.83     10.10          .15
  RHOICOSPHENIA CURVATA                 91.64    109.57    104.92    102.05      9.30         2.58
  SURIRELLA OVATA                         .00       .00     34.97     11.66     20.19          .30
  SYNEDRA SP.                             .00     21.91       .00      7.30     12.65          .18
  UNIDENTIFIED PENNATE DIATOMS            .00       .00     34.97     11.66     20.19          .30
                                     --------  --------  --------  --------  --------       ------
DIVISION TOTAL                        2756.98   4777.18   4266.87   3933.68   1050.51        99.60


CYANOPHYTA

  LYNGBYA SP.                             .00     23.77       .00      7.92     13.72          .20
  EUGLENA SP.                             .00       .00     23.77      7.92     13.72          .20
                                     --------  --------  --------  --------  --------       ------
DIVISION TOTAL                            .00     23.77     23.77     15.84     13.72          .40


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TOTAL DENSITY                         2756.98   4800.95   4290.63   3949.52   1063.82       100.00

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DIVERSITY INDEX CALCULATIONS
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SHANNON INDEX = 2.416
VARIANCE      =  .0006
MAXIMUM INDEX = 3.784
EVENNESS      =  .638
NO OF SPECIES =    44

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SAMPLE STATION:  WPD3 - HUNTER
REPLICATES - 3
SUBSTRATE - GLASS SLIDES

SAMPLE DATE - 10-04-82

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                                                  DENSITY (UNITS/MM2)

  TAXON                                 REP 1     REP 2     REP 3      MEAN      S.D.  % RELATIVE ABUNDANCE
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BACILLARIOPHYTA

  ACHNANTHES LANCEOLATA VAR. DUBIA      36.67      4.65      5.80     15.71     18.16         1.68
  ACHNANTHES MINUTISSIMA               407.44     41.81     66.29    171.84    204.39        18.42
  AMPHORA OVALIS VAR. AFFINIS             .00       .93       .00       .31       .54          .03
  AMPHORA PERPUSILLA                    48.89      7.43      8.29     21.54     23.69         2.31
  COCCONEIS PLACENTULA VAR. LINEATA    114.08     48.32     33.97     65.46     42.72         7.02
  CYCLOTELLA MENEGHINIANA                 .00      2.79       .00       .93      1.61          .10


  NO OF SPECIES =    46
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PERIPHYTON DENSITY AND SPECIES DIVERSITY ESTIMATES

CATHEDRAL BLUFFS SHALE OIL COMPANY
PICEANCE CREEK

SAMPLE STATION: WP01 - STEWART
REPLICATES - 3
SUBSTRATE - GLASS SLIDES

SAMPLE DATE - 11-03-82

	DENSITY (UNITS/MM2)					
TAXON	REP 1	REP 2	REP 3	MEAN	S.D.	% RELATIVE ABUNDANCE
BACILLARIOPHYTA						
ACHNANTHES LANCEOLATA VAR. DUBIA	16.92	.00	20.30	12.41	10.88	.32
ACHNANTHES LINEARIS	.00	.00	30.45	10.15	17.58	.26
ACHNANTHES MINUTISSIMA	202.98	282.03	385.72	290.24	91.64	7.55
AMPHORA PERPUSILLA	33.83	.00	40.60	24.81	21.75	.65
AMPHORA VENETA	.00	.00	10.15	3.38	5.86	.09
COCCONEIS PEDICULUS	.00	12.26	.00	4.09	7.08	.11
COCCONEIS PLACENTULA VAR. LINEATA	16.92	24.52	30.45	23.96	6.79	.62
CYCLOTELLA MENEGHINIANA	33.83	.00	10.15	14.66	17.36	.38
CYMBELLA MINUTA VAR. SILESIACA	33.83	.00	.00	11.28	19.53	.29
CYMBELLA SINUATA	.00	12.26	.00	4.09	7.08	.11
DIATOMA TENUE VAR. ELONGATUM	16.92	.00	.00	5.64	9.77	.15
DIATOMA VULGARE	.00	12.26	10.15	7.47	6.56	.19
FRAGILAREA CONSTRUENS VAR. BINODIS	.00	.00	50.75	16.92	29.30	.44
FRAGILARIA VAUCHERIAE	.00	.00	10.15	3.38	5.86	.09
GOMPHONEMA OLIVACEUM	253.73	564.05	416.17	411.32	155.22	10.70
GOMPHONEMA PARVULUM	16.92	12.26	30.45	19.88	9.45	.52
GOMPHONEMA SUBCLAVATUM	.00	.00	20.30	6.77	11.72	.18
GOMPHONEMA TENELLUM	.00	.00	30.45	10.15	17.58	.26
HANTZSCHIA AMPHIOXYS	.00	12.26	.00	4.09	7.08	.11
NAVICULA CRYPTOCEPHALA VAR. VENETA	389.05	416.91	406.02	403.99	14.04	10.51
NAVICULA HEUFLERI	33.83	49.05	.00	27.63	25.11	.72
NAVICULA MINIMA	.00	12.26	.00	4.09	7.08	.11
NAVICULA MUTICA	.00	.00	10.15	3.38	5.86	.09
NAVICULA MUTICA VAR. UNDULATA	16.92	.00	.00	5.64	9.77	.15
NAVICULA NOTHA	84.58	98.10	182.71	121.79	53.19	3.17
NAVICULA RHYNCHOCEPHALA	.00	.00	20.30	6.77	11.72	.18
NAVICULA SALINARUM VAR. INTERMEDIA	50.75	98.10	10.15	53.00	44.02	1.38
NAVICULA SECRETA VAR. APICULATA	84.58	134.88	131.96	117.14	28.24	3.05
NAVICULA TRIPUNCTATA	16.92	24.52	20.30	20.58	3.81	.54
NAVICULA TRIPUNCTATA VAR. SCHIZONEMO	16.92	.00	.00	5.64	9.77	.15
NAVICULA VIRIDULA VAR. AVENACEA	1708.45	1226.20	1015.05	1316.57	355.42	34.26
NITZSCHIA APICULATA	16.92	12.26	.00	9.73	8.74	.25
NITZSCHIA CAPITELLATA	.00	.00	20.30	6.77	11.72	.18
NITZSCHIA COMMUNIS	.00	.00	10.15	3.38	5.86	.09
NITZSCHIA DISSIPATA	541.29	637.62	578.58	585.83	48.57	15.25
NITZSCHIA FRUSTULUM	101.49	159.41	263.91	174.94	82.32	4.55
NITZSCHIA PALEACEA	.00	.00	10.15	3.38	5.86	.09
NITZSCHIA PALEA	.00	12.26	40.60	17.62	20.82	.46
RHOICOSPHENIA CURVATA	50.75	24.52	30.45	35.24	13.75	.92
SURIRELLA OVATA	16.92	12.26	50.75	26.64	21.01	.69
DIVISION TOTAL	3755.20	3850.27	3897.80	3834.42	72.61	99.79

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CYANOPHYTA

  LYNGBYA SP.                               23.77        .00        .00       7.92      13.72         .21
                                          --------   --------   --------   --------   --------      ------
DIVISION TOTAL                              23.77        .00        .00       7.92      13.72         .21

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TOTAL DENSITY                             3778.97    3850.27    3897.80    3842.35      59.81      100.00
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DIVERSITY INDEX CALCULATIONS
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SHANNON INDEX = 2.272
VARIANCE      =  .0005
MAXIMUM INDEX = 3.714
EVENNESS      =  .612
NO OF SPECIES =    41

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SAMPLE STATION:  WP02 - MIDDLE
REPLICATES - 3
SUBSTRATE - GLASS SLIDES

SAMPLE DATE - 11-03-82

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                                                       DENSITY (UNITS/MM2)

  TAXON                                    REP 1      REP 2      REP 3       MEAN       S.D.   % RELATIVE ABUNDANCE
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BACILLARIOPHYTA

  ACHNANTHES LANCEOLATA VAR. DUBIA        210.46      71.59     117.28     133.11      70.77        2.77
  ACHNANTHES MINUTISSIMA                  441.96     272.03     254.11     322.70     103.67        6.72
  AMPHORA PERPUSILLA                       63.14     100.22        .00      54.45      50.67        1.13
  COCCONEIS PEDICULUS                        .00      14.32        .00       4.77       8.27         .10
  COCCONEIS PLACENTULA VAR. EUGLYPTA         .00        .00      39.09      13.03      22.57         .27
  COCCONEIS PLACENTULA VAR. LINEATA        63.14      57.27      97.73      72.71      21.87        1.51
  CYCLOTELLA MENEGHINIANA                  21.05      42.95      19.55      27.85      13.10         .58
  CYMBELLA AFFINIS                         42.09        .00      39.09      27.06      23.48         .56
  CYMBELLA MINUTA VAR. SILESIACA             .00      14.32        .00       4.77       8.27         .10
  CYMBELLA SINUATA                         42.09      14.32        .00      18.80      21.40         .39
  FRAGILARIA CONSTRUENS                    21.05        .00        .00       7.02      12.15         .15
  FRAGILARIA LEPTOSTAURON                    .00      28.64        .00       9.55      16.53         .20
  FRAGILARIA VAUCHERIAE                    21.05        .00        .00       7.02      12.15         .15
  GOMPHONEMA OLIVACEUM                    463.00     100.22     312.75     291.99     182.28        6.08
  GOMPHONEMA PARVULUM                     105.23      57.27      78.19      80.23      24.04        1.67
  GOMPHONEMA SUBCLAVATUM                     .00      14.32        .00       4.77       8.27         .10
  GOMPHONEMA TENELLUM                      21.05        .00      58.64      26.56      29.71         .55
  HANTZSCHIA AMPHIOXYS                       .00      28.64        .00       9.55      16.53         .20
  NAVICULA AEVENSIS                        21.05        .00        .00       7.02      12.15         .15
  NAVICULA CRYPTOCEPHALA VAR. VENETA         147.32     243.40     156.37     182.36      53.05          3.80
  NAVICULA HEUFLERI                           63.14      28.64      39.09      43.62      17.69           .91
  NAVICULA MINIMA                             42.09        .00      19.55      20.55      21.06           .43
  NAVICULA NOTHA                             105.23     286.35     156.37     182.65      93.38          3.80
  NAVICULA SALINARUM VAR. INTERMEDIA          42.09      28.64      19.55      30.09      11.34           .63
  NAVICULA SECRETA VAR. APICULATA            210.46     214.76     175.92     200.38      21.29          4.17
  NAVICULA TRIPUNCTATA                        21.05        .00        .00       7.02      12.15           .15
  NAVICULA TRIPUNCTATA VAR. SCHIZONEMO          .00      28.64        .00       9.55      16.53           .20
  NAVICULA VIRIDULA VAR. AVENACEA           2125.61    1503.34    1974.22    1867.72     324.52         38.88
  NITZSCHIA APICULATA                           .00        .00      19.55       6.52      11.29           .14
  NITZSCHIA CAPITELLATA                         .00      28.64        .00       9.55      16.53           .20
  NITZSCHIA DISSIPATA                        589.28    1002.23     332.29     641.27     337.98         13.35
  NITZSCHIA FRUSTULUM                        378.82     357.94     156.37     297.71     122.85          6.20
  NITZSCHIA GRACILIS                            .00      14.32        .00       4.77       8.27           .10
  NITZSCHIA PALEA                               .00      28.64        .00       9.55      16.53           .20
  NITZSCHIA TRYBLIONELLA VAR. LEVIDENS        21.05        .00        .00       7.02      12.15           .15
  NITZSCHIA SP.                                 .00      14.32        .00       4.77       8.27           .10
  RHOICOSPHENIA CURVATA                       63.14      42.95      19.55      41.88      21.81           .87
  SURIRELLA OVATA                             42.09      71.59      58.64      57.44      14.78          1.20
  SYNEDRA ACUS                                  .00        .00      19.55       6.52      11.29           .14
  SYNEDRA DELICATISSIMA                       21.05        .00        .00       7.02      12.15           .15
  SYNEDRA ULNA                                21.05        .00        .00       7.02      12.15           .15
  UNIDENTIFIED PENNATE DIATOMS                63.14      42.95        .00      35.36      32.25           .74
                                           --------   --------   --------   --------   --------        ------
DIVISION TOTAL                              5492.92    4753.42    4163.46    4803.26     666.13        100.00


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TOTAL DENSITY                               5492.92    4753.42    4163.46    4803.26     666.13        100.00
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DIVERSITY INDEX CALCULATIONS
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SHANNON INDEX = 2.358
VARIANCE      =  .0004
MAXIMUM INDEX = 3.738
EVENNESS      =  .631
NO OF SPECIES =    42

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SAMPLE STATION:  WP03 - HUNTER
REPLICATES - 3
SUBSTRATE - GLASS SLIDES

SAMPLE DATE - 11-03-82

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                                                                DENSITY (UNITS/MM2)

  TAXON                                       REP 1      REP 2      REP 3       MEAN       S.D.   % RELATIVE ABUNDANCE
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BACILLARIOPHYTA

  ACHNANTHES LANCEOLATA                         .00        .30        .00        .10        .17           .06
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ACHNANTHES LANCEOLATA VAR. DUBIA	14.01	1.49	.00	5.17	7.70	3.33
ACHNANTHES MINUTISSIMA	17.13	8.62	.74	8.83	8.19	5.70
AMPHORA OVALI, VAR. AFFINIS	.00	.30	.00	.10	.17	.06
AMPHORA PERPUSILLA	3.11	2.67	.37	2.05	1.47	1.32
COCCONEIS PLACENTULA VAR. LINEATA	7.78	11.29	15.24	11.44	3.73	7.38
CYCLOTELLA MENEGHINIANA	1.56	.89	3.35	1.93	1.27	1.25
CYMBELLA AFFINIS	4.67	.59	.37	1.88	2.42	1.21
CYMBELLA CYMBIFORMIS	.00	.00	.37	.12	.22	.08
CYMBELLA MINUTA VAR. SILESIACA	.00	.00	.74	.25	.43	.16
CYMBELLA SINUATA	.00	.00	.37	.12	.22	.08
DIATOMA VULGARE	.00	.59	.00	.20	.34	.13
FRAGILARIA LEPTOSTAURON	.00	.00	.74	.25	.43	.16
FRAGILARIA VAUCHERIAE	4.67	1.19	1.12	2.32	2.03	1.50
GOMPHONEMA OLIVACEUM	13.23	14.56	9.67	12.49	2.53	8.06
GOMPHONEMA PARVULUM	.00	.89	1.86	.92	.93	.59
GOMPHONEMA TENELLUM	1.56	1.49	2.60	1.88	.63	1.21
NAVICULA CRYPTOCEPHALA VAR. VENETA	10.12	4.16	5.20	6.49	3.18	4.19
NAVICULA HEUFLERI	3.89	2.08	1.12	2.36	1.41	1.52
NAVICULA LANCEOLATA VAR. DUBIA	.00	.00	.74	.25	.43	.16
NAVICULA MINIMA	.78	.00	.74	.51	.44	.33
NAVICULA MUTICA	.00	1.49	.37	.62	.77	.40
NAVICULA NOTHA	7.01	4.46	4.46	5.31	1.47	3.42
NAVICULA PUPULA	.00	.00	.37	.12	.22	.08
NAVICULA SALINARUM VAR. INTERMEDIA	1.56	.00	2.23	1.26	1.14	.81
NAVICULA SECRETA VAR. APICULATA	5.45	5.35	3.35	4.71	1.19	3.04
NAVICULA TRIPUNCTATA VAR. SCHIZONEMO	.78	.00	.74	.51	.44	.33
NAVICULA VIRIDULA VAR. AVENACEA	77.84	29.71	37.92	48.49	25.75	31.29
NAVICULA SP.	.00	.59	.00	.20	.34	.13
NITZSCHIA APICULATA	2.34	1.19	.37	1.30	.99	.84
NITZSCHIA DISSIPATA	11.68	8.91	5.58	8.72	3.05	5.63
NITZSCHIA FRUSTULUM	15.57	9.51	11.15	12.08	3.13	7.79
NITZSCHIA HUNGARICA	.00	.59	1.12	.57	.56	.37
NITZSCHIA PALEA	.00	.30	.00	.10	.17	.06
NITZSCHIA SIGMOIDEA	.78	.00	.00	.26	.45	.17
PINNULARIA BREBISSONII	.00	.59	.00	.20	.34	.13
RHOICOSPHENIA CURVATA	14.01	3.86	3.35	7.07	6.01	4.56
RHOPALODIA MUSCULUS	.78	.00	.00	.26	.45	.17
STEPHANODISCUS SP.	1.56	.00	.00	.52	.90	.33
SURIRELLA OVATA	.00	.59	.74	.45	.39	.29
SYNEDRA ACUS	.78	.00	.37	.38	.39	.25
SYNEDRA AMPHICEPHALA	.78	.00	.00	.26	.45	.17
UNIDENTIFIED PENNATE DIATOMS	.00	.30	.74	.35	.37	.22
DIVISION TOTAL	223.41	118.54	118.22	153.39	60.64	98.98
CYANOPHYTA						
ANABAENA SP.	.00	.00	4.75	1.58	2.74	1.02
DIVISION TOTAL	.00	.00	4.75	1.58	2.74	1.02
TOTAL DENSITY	223.41	118.54	122.98	154.98	59.31	100.00

DIVERSITY INDEX CALCULATIONS

SHANNON INDEX = 2.658

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VARIANCE       =  .0109
MAXIMUM INDEX = 3.784
EVENNESS       =  .703
NO OF SPECIES =    44
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The green algae (Chlorophyta) increased in importance in mid-summer, peaked in the July 29 samples and accounted for 10 to 23% of the total mean periphyton density over all sample periods. The increased importance of green algae in the summer samples was due primarily to a growth pulse of Stigeoclonium tenue.

The mean density values for the three Piceance Creek locations are listed for each sampling date in Table 2.5.2-15. Density values ranged from 155 algal units/mm^2 (Hunter Station-November 3 sample) to 20,452 algal units/mm^2 (Middle Station-June 1 sample) and evidenced both spatial and temporal variations. The highest density for Stewart Station occurred in September while the highest densities for Middle and Hunter Station were in June. The periphyton densities at Hunter Station were reduced in the last three samples by the effects of flooding that destroyed the July 29 sample and deposited 2-4 feet of silt at the sample station. This silt persisted through the November sampling period and comprised almost 90% of the substrate (as compared to only 40% before flooding).

The dominant members of the periphton community at Stewart Station in 1982 are presented in Table 2.5.2-16 along with quantitative results from previous years. Navicula viridula var. avenacea was a dominant taxa throughout the 1982 sampling year. Achnanthes minutissima, Rhoicospheria curvata, Nitzschia dissipata, Nitzschia frustulum, Gonphonema olivaceum, were also abundant while other Nitzschia and Navicula species varied seasonally. The green algae Stigeoclonium tenue occurred as a dominant on July 29; this can be attributed to its growth preference for warmer water temperatures. The periphyton density at Stewart Station in 1982 increased from a spring minimum of 3349 units/mm^2 to a high density of 13275 units/mm^2 on September 2 and decreased again toward fall.

The dominant taxa observed at Middle Station in 1982 are presented in Table 2.5.2-17 with the quantitative results from previous sampling years. In 1982, Middle Station showed a periphyton assemblage and seasonal variation similar to that of Stewart Station. Periphyton density in spring was much higher than at Stewart Station (20,452 units/mm^2) and showed a somewhat lower summer density peak on September 2 (8507 units/mm^2).

The dominant taxa observed at Hunter in 1982 along with the quantitative results from previous sampling years are presented in Table 2.5.2-18. In spring and early summer, 1982, the periphyton assemblages at Hunter Station were similar to those at the other sampling stations. The periphyton density was high on the first two sampling periods (14,563 and 13,001 units/mm^2) with spring values similar to that at Hunter Station and early summer values higher than at the two other stations. For the summer through fall samples the periphyton community at Hunter Station was seriously effected by the late July flash flood and the accompanying scouring and silt deposition. The dominant taxa in the periphyton after the flood consisted of the early colonizers of artificial substrates such as Achnanthes species and Cocconeis species. (Cholnoky 1968). By November 3, the periphyton assemblage was similar to that found at the other stations but densities were still much lower.

TABLE 2.5.2-15

MEAN DENSITIES (units/mm^2) OF PERIPHYTON SAMPLES COLLECTED FROM PICEANCE CREEK DURING 1982

Sample Date	Stewart Station	Middle Station	Hunter Station
June 1	3349	20452	14563
June 30	7851	3190	13001
July 29	6678	2980	1/
September 2	13275	8507	1051
October 4	8707	3950	933
November 3	3731	4803	155

1/ Samples destroyed by flash flood.

TABLE 2.5.2-16

DOMINANT PERIPHYTON SPECIES (>5% mean relative abundance)
OCCURRING AT STEWART STATION, FROM 1978 THROUGH 1982
(values rounded to the nearest percent)

SPECIES	MEAN RELATIVE ABUNDANCE (%)				
	1978	1979	1980	1981	1982
LATE MAY - EARLY JUNE					
Achnanthes minutissima	+1/	11	2/	+	12
Navicula cryptocephala var. veneta	13	- 3/		+	+
N. secreta var. apiculata	12	19		7	+
N. tripunctata var. schizomoides	6	-		-	+
N. viridula var. avenacea	+	42		60	59
N. spp.	8	+		-	-
Nitzshia dissipata	-	-		6	+
N. palea	7	-		+	-
N. spp.	27	10		-	+
Surirella angustata	+	+		-	-
S. ovata	5	+		+	+
unidentified pennate diatoms	5	-		-	+
LATE JUNE - EARLY JULY					
Achnanthes minutissima	7	13	+	10	10
Fragilaria vaucheriae	-	6	+	+	+
Gomphonema olivaceum	+	6	+	+	+
G. parvulum	+	9	-	-	-
Navicula cryptocephala var. veneta	+	-	+	5	+
N. secreta var. apiculata	9	-	7	-	+
N. viridula	-	-	44	28	-
N. viridula var. avenacea	+	28	-	-	28
Nitzschia acicularis	25	+	+	-	+
N. dissipata	+	*4/	*	+	6
N. fonticola	-	-	7	-	+
N. frustulum	-	-	-	16	+
N. palea	9	-	7	+	+
N. paleacea	-	*	*	-	5
N. spp.	42	19	-	-	+
Rhoicosphenia curvata	-	*	*	+	8
Surirella ovata	+	+	9	+	-
Synedra ulna var. oxyrhynchus	-	+	-	6	-

TABLE 2.5.2-16 (Contd)

SPECIES	MEAN RELATIVE ABUNDANCE (%)				
	1978	1979	1980	1981	1982
LATE JULY - EARLY AUGUST					
Achnanthes lanceolata	9	14	+	-	-
A. l. var. dubia	41	+	+	+	+
A. minutissima	35	29	6	16	+
Cocconeis placentula	-	-	+	13	-
C. placentula var. euglypta	+	34	-	-	-
C. placentula var. lineata	-	*	*	-	5
Navicula secreta var. apiculata	+	-	13	-	+
N. viridula	-	-	25	+	-
N. viridula var. avenacea	+	10	-	-	12
Nitzshia dissipata	-	-	20	6	+
N. frustulum	-	-	9	15	+
Rhoicosphenia curvata	+	-	+	9	18
palmella stage of Chaetophoraceae	-	-	-	11	-
Phormididium sp.	+	-	-	8	+
Stigeoclonium tenue	+	-	-	-	8
LATE AUGUST - EARLY SEPTEMBER					
Achnanthes lanceolata	+	14	+	-	-
A. lanceolata var. dubia	32	-	-	+	+
A. minutissima	13	57	42	+	5
Cocconeis pediculus	11	-	-	+	+
C. placentula var. euglypta	9	22	-	-	-
Gomphonema angustatum	-	-	+	6	-
Navicula cryptocephala var. veneta	+	*	*	+	8
N. secreta var. apiculata	7	-	+	6	+
N. viridula var. avenacea	+	*	*	+	22
Nitzschia dissipata	-	-	28	10	14
N. frustulum	-	-	5	16	11
N. holsatica	-	-	-	6	-
N. palea	-	-	+	7	+
Rhoicosphenia curvata	+	*	*	+	6
Draparnaldia sp.	-	-	-	13	-
LATE SEPTEMBER - EARLY OCTOBER					
Achnanthes lanceolata var. dubia	+	5/	12	14	+
A. minutissima	84		25	19	24
Cocconeis pediculus	6		+	+	-
C. placentula	-		42	39	-
Navicula viridula var. avenacea	-		*	+	26
Nitzschia dissipata	-		10	+	19
N. frustulum	-		*	+	5
palmella stage of Chaetophoraceae	-		+	15	-

TABLE 2.5.2-16 (Contd)

	MEAN RELATIVE ABUNDANCE (%)				
SPECIES	1978	1979	1980	1981	1982
LATE OCTOBER - EARLY NOVEMBER					
Achnanthes lanceolata	+	7	-	-	-
A. minutissima	75	79	47	+	8
Cocconeis pediculus	7	-	+	+	+
Gomphonema angustatum	-	-	-	7	-
G. olivaceum	+	+	8	+	11
Navicula cryptocephala var. *veneta*	+	*	*	+	11
N. secreta var. *apiculata*	+	+	6	+	+
N. viridula var. *avenacea*	+	+	11	13	34
Nitzschia dissipata	+	-	9	12	15
N. frustulum	-	-	+	7	+
N. palea	-	-	+	7	+
Rhoicosphena curvata	+	+	+	7	+

1/ + = present at <5% mean relative abundance

2/ Periphyton not sampled in May 1980

3/ - = absent

4/ * = Information not available at report time

5/ Periphyton not sampled in September 1979

TABLE 2.5.2-17

DOMINANT PERIPHYTON SPECIES (>5% mean relative abundance)
OCCURRING AT MIDDLE STATION, 1979 THROUGH 1982
(values rounded to the nearest percent)

SPECIES	MEAN RELATIVE ABUNDANCE (%) 1979	1980	1981	1982
LATE MAY - EARLY JUNE				
Achnanthes lanceolata	1/	1/	43	+2/
A. minutissima			19	9
Cocconeis placentula			5	-3/
Navicula viridula var. avenacea			+	50
Nitzschia dissipata			+	8
Chaetophoraceae sp.			19	-
LATE JUNE - EARLY JULY				
Achnanthes lanceolata	30	+	+	-
A. minutissima	9	+	-	+
Navicula secreta var. apiculata	-	8	-	+
N. viridula	-	+	24	-
N. viridula var. avenacea	23	-	-	52
Nitzschia acicularis	+	11	-	-
N. dissipata	-	+	14	+
N. frustulum	-	+	28	6
N. holsatica	-	26	+	-
N. palea	-	10	+	+
N. spp.	14	-	-	+
palmella stage of Chaetophoraceae	-	5	-	-
LATE JULY - EARLY AUGUST				
Achnanthes lanceolata	6	+	+	+
A. lanceolata var. dubia	*4/	*	+	7
A. minutissima	45	+	33	+
Gomphonema angustatum	-	+	5	-
G. parvulum	15	-	-	+
Navicula secreta var. apiculata	-	19	-	+
N. viridula	-	30	+	-
N. viridula var. avenacea	*	*	+	11
Nitzschia frustulum	-	+	21	-
N. holsatica	-	9	-	-
N. palea	-	14	+	+
N. spp.	8	-	-	+
Rhoicosphena curvata	+	+	11	14
Cladophora sp.	11	-	+	-
Stigeoclonium tenue	*	*	-	20

TABLE 2.5.2-17 (Contd)

SPECIES	MEAN RELATIVE ABUNDANCE (%)			
	1979	1980	1981	1982
LATE AUGUST - EARLY SEPTEMBER				
Achnanthes lanceolata	29	8	-	-
A. minutissima	42	48	5	+
Cocconeis placentula	-	20	+	-
C. placentula var. euglypta	21	-	-	+
Diatoma tenue var. elongatum	-	-	11	+
Fragilaria crotonensis	+	-	21	-
Navicula cryptocephala var. veneta	*	*	+	8
N. heufleri	*	*	+	7
N. viridula var. avenacea	*	*	+	31
Nitzschia dissipata	*	*	+	6
N. frustulum	*	*	+	8
Rhoicosphenia curvata	*	*	+	9
Synedra fasciculata	-	-	13	+
S. ulna var. oxyrhynchus	-	-	5	-
palmella stage of Chaetophoraceae	-	7	+	-
LATE SEPTEMBER - EARLY OCTOBER				
Achnanthes lanceolata var. dubia	5/	11	+	+
A. mintussima		59	39	9
Cocconeis placentula		12	14	-
Gomphonema angustatum		-	9	-
Navicula viridula var. avenacea		*	+	39
Nitzschia dissipata		*	+	9
N. frustulum		*	+	7
palmella stage of Chaetophoraceae		5	10	-
LATE OCTOBER - EARLY NOVEMBER				
Achnanthes lanceolata	18	+	-	-
A. mintussima	44	15	6	7
Cocconeis placentula var. euglypta	5	-	-	+
C. placentula var. lineata	7	-	-	+
Cymbella minuta var. silesiaca	-	5	+	+
Cymbella minuta var. veneta	-	5	14	-
Gomphonema olivaceum	*	*	+	6
Navicula secreta var. apiculata	7	9	+	+
N. viridula var. avenacea	5	31	16	39
Nitzschia dissipata	*	*	+	13
N. frustulum	*	*	+	6
N. spp.	5	-	+	+
Rhoicosphenia curvata	+	+	5	+
palmella stage of Chaetophoraceae	-	11	-	-

TABLE 2.5.2-17 (Contd)

1/ Periphyton not sampled in May 1979 and 1980

2/ + = present at <5% mean relative abundance

3/ - = absent

4/ * = Information not available at report time

5/ Periphyton not sampled in late September 1979

TABLE 2.5.2-18

DOMINANT PERIPHYTON SPECIES (>5% mean relative abundance) OCCURRING AT HUNTER STATION, 1977 THROUGH 1982 (values rounded to the nearest percent)

	MEAN RELATIVE ABUNDANCE (%)					
SPECIES	1977	1978	1979	1980	1981	1982
LATE MAY - EARLY JUNE						
Achnanthes lanceolata var. *dubia*	+1/	+	+	2/	10	+
A. minutissima	+	6	8		51	+
Navicula secreta var. *apiculata*	+	11	9		+	+
N. tripunctata var. *schizonemoides*	-3/	15	-		-	+
N. *viridula* var. *avenacea*	65	+	57		13	51
N. spp.	+	5	+		-	-
Nitzschia palea	5	6	-		6	13
N. spp.	+	26	16		-	+
unidentified pennate diatoms	+	7	-		-	-
Stigeoclonium tenue	-	+	-		6	-
LATE JUNE - EARLY JULY						
Achnanthes lanceolata var. *dubia*	4/	8	6	+	+	+
A. minutissima		8	+	+	+	6
Gomphonema parvulum		+	23	-	-	+
Navicula secreta var. *apiculata*		+	-	5	-	+
N. viridula		-	-	58	13	-
N. viridula var. *avenacea*		11	48	-	-	26
Nitzschia acicularis		31	-	+	-	-
N. frustulum		-	-	-	5	32
N. holsatica		-	-	13	-	-
N. linearis		-	-	+	9	+
N. palea		11	-	11	5	+
N. spp.		17	15	-	-	-
Surirella ovalis		+	-	-	13	+
S. ovata		+	+	5	+	+
Synedra ulna		-	+	-	7	-
Thalassiosira fluviatilis		-	-	-	26	+

TABLE 2.5.2-18 (Contd)

SPECIES	MEAN RELATIVE ABUNDANCE (%) 1977	1978	1979	1980	1981	1982
LATE JULY - EARLY AUGUST						
Achnanthes lanceolata	5/	6	7	+	-	9/
A. lanceolata var. dubia		26	+	-	+	
A. minutissima		38	41	+	61	
Gomphonema parvulum		+	13	+	-	
Navicula cryptocephala		-	7	+	-	
N. secreta var. apiculata		+	-	9	-	
N. viridula		-	-	67	+	
N. viridula var. avenacea		+	8	-	-	
Nitzschia dissipata		-	-	5	6	
N. frustulum		-	-	+	7	
N. spp.		+	14	-	-	
Rhoicosphenia curvata		+	+	+	5	
Stigeoclonium sp.		9	-	-	-	
LATE AUGUST - EARLY SEPTEMBER						
Achnanthes lanceolata	6/	+	12	+	-	-
A. lanceolata var. dubia		23	-	+	+	+
A. minutissima		32	76	50	27	-
Cocconeis pediculus		12	-	+	-	-
C. placentula		-	-	5	+	-
C. placentula var. euglypta		6	7	-	-	+
C. placentula var. lineata		-	*10/	*	-	74
Cymbella minuta var. silesiaca		-	-	+	7	-
Gomphonema angustatum		-	-	+	13	-
G. olivaceum		+	*	*	+	5
Navicula viridula var. avenacea		+	+	-	9	+
Nitzschia dissipata		+	-	10	19	+
palmella stage of Chaetophoraceae		-	-	11	-	-
LATE SEPTEMBER - EARLY OCTOBER						
Achnanthes lanceolata var. dubia	7/	8/	7/	31	+	+
A. minutissima				16	37	18
Cocconeis pediculus				10	-	-
C. placentula				30	+	-
C. placentula var. lineata				*	-	7
Cymbella minuta var. silesiaca				+	10	-
Gomphonema angustatum				-	10	-
Navicula viridula var. avenacea				*	+	9
Nitzschia dissipata				+	6	11
N. frustulum				+	9	13
Rhoicosphenia curvata				*	+	9
Stigeoclonium tenue				-	7	+

TABLE 2.5.2-18 (Contd)

SPECIES	MEAN RELATIVE ABUNDANCE (%)					
	1977	1978	1979	1980	1981	1982
LATE OCTOBER - EARLY NOVEMBER						
Achnanthes lanceolata	-	-	49	+	+	+
A. lanceolata var. *dubia*	+	9	-	+	6	+
A. minutissima	+	+	20	5	21	6
Cocconeis pediculus	+	6	-	+	-	-
C. placentula	15	+	-	+	6	-
C. placentula var. *euglypta*	-	27	+	-	-	-
C. placentula var. *lineata*	*	-	*	*	-	7
Gomphonema angustatum	-	-	-	-	8	-
G. olivaceum	+	+	+	+	8	8
Navicula cryptocephala var. *veneta*	-	+	-	+	6	+
N. secreta var. *apiculata*	23	10	10	+	+	+
N. viridula var. *avenacea*	22	28	10	72	+	31
Nitzschia dissipata	*	-	*	*	+	6
N. frustulum	-	-	-	+	12	8
N. palea	+	-	-	-	5	+
N. spp.	12	-	-	-	-	-
Rhoicosphenia curvata	*	+	*	*	+	5
palmella stage of Chaetophoraceae	-	-	-	5	+	-

1/ + = present at <5% mean relative abundance

2/ Periphyton not sampled in May 1980

3/ - = absent

4/ Periphyton not sampled in late June - early July 1977

5/ Periphyton not sampled in late July - early August 1977

6/ Periphyton not sampled in late August - early September 1977

7/ Periphyton not sampled in late September 1977 and 1979

8/ Sampler destroyed in 1978

9/ Sampler destroyed in 1982

10/ * = Data not available at report time

Only qualitative periphyton data were obtained in 1974-1976 (C-b Annual Report of 1977). As a result, no information is available for comparison of relative abundance and dominance. Since Middle Station was initiated into the monitoring program in 1979, comparison of the three stations can only be made subsequent to 1979. The Stewart Station site was moved to its present location after the 1977 sampling season. Hence quantitative comparisons can be made for this station from 1978 to 1981, while quantitative records for Hunter Station are available from 1977-1981.

Annual variations are occurring in Piceance Creek based on comparisons of 1982 periphyton samples with previous periphyton analysis. The periphyton communities in 1977-1981 samples showed temporal variations between communities dominated by *Navicula* species and *Nitzschia* species and communities dominated by *Achnanthes* species and *Cocconeis* species. In 1982, however, *Navicula* species dominated at all stations with the exception of the flood effected Hunter Station, with *Nitzschia* species and *Achnanthes* species occurring as co-dominant with seasonal variations.

Differences in sampling techniques may have been responsible for some of the variation observed over the years. In addition, the glass slide incubation time may not have been long enough on some sampling dates or the incubation disturbed by flood or other intervention.

As a result, the flora collected on these dates may have been in the phase of accumulation rather than the more stable phase of reconstruction (Hutchinson 1975). The organisms which are flat and can attach themselves directly to the substrate are usually the first to colonize glass slides. Examples include *Achnanthes lanceolata*. *A. minutissima*, *Cocconeis pediculus*, and *C. placentula*. Stalk and tube-forming diatoms occur during the reconstruction phase; *Cymbella* species, *Gomphonema* species, and *Navicula viridula* are examples of these organisms. Also, annual differences may have been due to a combination of environmental factors such as light (turbidity), temperature, flow rate, nutrients, and pH. Any or all of these factors may vary on an annual basis regardless of man-made perturbations.

Fisher's LSD procedure (1979) was used to determine if significant differences occurred in periphyton densities at Tract C-b sampling stations between 1981 and 1982 and if differences existed among stations during each 1982 sample period. The results of this analysis of variance procedure are provided in Tables 2.5.2-19 and 2.5.2-20, respectively. In the comparison of 1981 with 1982 data, a significant difference of at least 10% was noted between all sample stations with the following exceptions: Stewart Station - June and July, Middle Station - June and August, Hunter Station - May. An evaluation of 1982 data showed a significant difference of at least 5% between all sample stations during each sample period with only one exception: there were no apparent differences in periphyton densities between Stewart and Middle Station during October.

Periphyton biomass, a measure of productivity, is summarized for 1982 samples in Table 2.5.2-21. At Stewart and Hunter Stations periphyton ash-free dry weight showed similar trends to the

TABLE 2.5.2-19

COMPARISON OF 1981 AND 1982 PERIPHYTON DENSITIES AT EACH SAMPLING STATION DURING EACH SAMPLING PERIOD USING FISHER'S LSD PROCEDURE (1949)[1/]

Month	Stewart	Middle	Hunter
May	1%	1%	-
June	-	-	5%
July	-	1%	No data - 1982
August	1%	-	1%
September	10%	1%	1%
October	1%	1%	1%

[1/] - = No significant difference between year
10% = Difference significant at the 10% level
5% = Difference significant at the 5% level
2% = Difference significant at the 2% level
1% = Difference significant at the 1% level

TABLE 2.5.2-20

COMPARISON OF PERIPHYTON DENSITIES BETWEEN EACH SAMPLING STATION DURING 1982 USING FISHER'S LSD PROCEDURE (1949)[1/]

Sample Station	May	June	July	August	September	October
Stewart-Middle	1%	1%	2%	1%	1%	-
Stewart-Hunter	1%	1%	[2/]	1%	1%	2%
Middle-Hunter	1%	1%	[2/]	1%	1%	1%
Stewart and Middle-Hunter	5%	1%	[2/]	1%	1%	1%

[1/] - = No significant difference between year
10% = Difference significant at the 10% level
5% = Difference significant at the 5% level
2% = Difference significant at the 2% level
1% = Difference significant at the 1% level

[2/] Data missing for Hunter Station - July 1982

TABLE 2.5.2-21

MEAN PERIPHYTON BIOMASS (mg ash-free dry weight/cm^2) FROM PICEANCE CREEK, JUNE THROUGH NOVEMBER 1982, TRACT C-b

Sample Date	Stewart Station	Middle Station	Hunter Station
June 1	1.104	1.940	1.500
June 30	1.523	1.281	1.871
July 29	1.678	1.019	1/
September 2	1.473	1.416	0.132
October 4	0.835	1.024	0.213
November 3	0.596	0.650	0.038

1/ Samples destroyed by flash flood

periphyton densities observed at these stations. In general, biomass increased to an early or late summer high and decreased in the fall. Hunter Station has ash-free dry weight values similar to those for Stewart and Middle Stations for the first two sampling periods and much lower values for the samples collected after the late summer flood. In 1975, 1976, 1977, 1979, and 1980, biomass was usually higher at Stewart Station than at Hunter Station, but was higher at the latter station in 1978, 1981, and 1982 (only the first two sample periods are used for comparison). In 1979, biomass productivity at Middle Station was generally higher than at Hunter Station, while Stewart and Middle Stations alternated positions throughout the year. In 1980, biomass productivity at Middle Station tended to be higher than at the other two stations. However, the 1981 and 1982 biomass at Middle Station was generally higher than Stewart Station but lower than Hunter Station, except after the flood at Hunter Station.

A statistical comparison of 1981 with 1982 periphyton biomass data using Fisher's LSD procedure is provided in Table 2.5.2-22; a comparison of periphyton biomass between each sampling station during 1982 is provided in Table 2.5.2-23. Periphyton biomass was generally higher at all stations during 1982 than during 1981; the exceptions are August and October samples at Hunter Station. In all comparisons except Stewart Station for July and September and Middle Station for May, the difference between the two years was significant at at least the 2% level. The comparison of biomass at different stations between 1982 showed that Stewart and Middle Station were most similar while significant differences occurred between Stewart and Hunter and between Middle and Hunter Station over almost all samples.

Diversity values estimated for each sample location during each 1982 sample period are presented in Table 2.5.2-24. Diversity values are a relative measure of environmental stress on a community; they generally decrease with increased stress. Diversities for 1982 ranged from 1.26 at Hunter Station in September, following the floods, to 3.09 at Stewart Station in July. At Stewart and Middle Station the highest diversity occurred in July while at Hunter Station the highest diversity occurred in October. Because the number of taxa found in a sample can effect the range of possible diversity values, the evenness values, E, are better for comparing samples with varying numbers of species counted. Evenness at Stewart and Middle Stations were similar throughout the 1982 sampling season with the highest values occurring in July. At Hunter Station evenness values were similar to the other stations except immediately following the July flood when it was lower.

Diversity values in previous sample years were similar to those found in 1982, though peak diversities occurred at different times. In 1981, diversities at Stewart, Middle and Hunter Stations were highest during fall. In 1980, diversities at Stewart and Middle Stations were highest during summer but were highest in early fall at Hunter Station. In 1979, highest values occurred during summer months, while the lowest occurred in fall. Diversity values in 1978 decreased steadily at Stewart and Hunter Stations between May and July but increased in August. Lowest values for both stations occurred in fall. The low density values recorded in 1978, 1979, 1980, and 1981 occurred mainly when _Achnanthes_ species and _Cocconeis_

TABLE 2.5.2-22

COMPARISON OF 1981 AND 1982 PERIPHYTON BIOMASS AT EACH SAMPLING PERIOD DURING EACH SAMPLING PERIOD USING FISHER'S LSD PROCEDURES (1949)[1/]

Month	Stewart	Middle	Hunter
May	1%	-	1%
June	1%	1%	1%
July	-	1%	2/
August	1%	1%	1%
September	-	1%	1%
October	2%	1%	1%

[1/] - = No significant difference between year
10% = Difference significant at the 10% level
5% = Difference significant at the 5% level
2% = Difference significant at the 2% level
1% = Difference significant at the 1% level

[2/] Data missing for Hunter Station - July 1982

TABLE 2.5.2-23

COMPARISON OF PERIPHYTON BIOMASS BETWEEN EACH SAMPLE STATION DURING 1982 USING FISHER'S LSD PROCEDURE (1949)[1]

Sample Station	May	June	July	August	September	October
Stewart-Middle	2%	-	5%	-	-	-
Stewart-Hunter	2%	-	[2]	1%	1%	2%
Middle-Hunter	-	10%	[2]	1%	5%	10%
Stewart and Middle-Hunter	-	10%	[2]	1%	1%	5%

[1] - = No significant difference between year
10% = Difference significant at the 10% level
5% = Difference significant at the 5% level
2% = Difference significant at the 2% level
1% = Difference significant at the 1% level

[2] Data missing for Hunter Station - July 1982

TABLE 2.5.2-24

SHANNON-WEINER DIVERSITY (H'), MAXIMUM DIVERSITY (H'max), EVENNESS (E), AND TOTAL NUMBER OF TAXA (N) IN PERIPHYTON COLLECTED FROM PICEANCE CREEK, JUNE THROUGH NOVEMBER 1982, TRACT C-b

	Stewart Station				Middle Station				Hunter Station			
Sample Date	H'	H'max	E	N	H'	H'max	E	N	H'	H'max	E	N
June 1	1.85	3.66	0.51	39	2.17	3.69	0.59	40	2.07	3.58	0.58	36
June 30	2.78	3.64	0.76	38	2.28	3.89	0.59	49	2.36	3.69	0.64	40
July 29	3.09	4.01	0.77	55	2.95	3.89	0.76	49	1/	1/	1/	1/
September 2	2.77	3.85	0.72	47	2.69	3.87	0.70	48	1.26	3.22	0.39	25
October 4	2.17	3.30	0.66	27	2.42	3.78	0.64	44	2.71	3.83	0.71	46
November 3	2.27	3.71	0.61	41	2.36	3.74	0.63	42	2.66	3.78	0.70	44

1/ Samples destroyed by flash flood

species dominated the periphyton. These genera are early colonizers of glass slides; species diversity values are usually low during the earliest stage of colonization (Hutchinson 1975).

A multitude of factors such as flood, irrigation, cattle grazing, springs, and Tract C-b discharge may affect Piceance Creek aquatic systems. Since Hunter Station was so severly impacted in late July by flood, scour, and siltation, valid comparisons of periphyton composition and density are limited with respect to monitoring water quality effects of Tract C-b discharge. The periphyton diversity values for Hunter Station after the initial recovery from the floods may be useful, however, in evaluating water quality and possible Tract C-b discharge impacts. Discharge from Tract C-b development activities only affects Hunter Station; based on 1982 data before flooding occurred in late July no discernible impact to the Piceance Creek aquatic system can be attributed to Tract C-b. Any variations observed from the early baseline studies through the 1982 study seem to be attributable to agricultural impacts and natural variations.

TERRESTRIAL VEGETATION STUDIES

2.5.3 Terrestial Vegetation Studies

The 1982 vegetation studies were conducted in accordance with the Approved Interim Monitoring Program for the C.B. Project. The Terrestial Vegetation Studies in 1982 consisted of sampling the community structure and composition of the Irrigation Study Plot, sampling for herbaceous production and utilization (range cages and adjacent open areas) in the chained pinyon-juniper rangeland and irrigated chained pinyon-juniper rangeland, (see Figure 2.5-1 for locations of range cages and adjacent open areas), and sampling for herbaceous biomass in the irrigation/fertilization study plots. Tables 2.5.3-1 to -10 show the results of these studies.

The results of the community structure and composition sampling of the Irrigation Study Plot show a decrease in herbaceous cover in 1982, along with some minor differences in species frequency. These differences could be the result of two possible reasons: 1) Heavy utilization in the area in 1982 - the vegetation in the area was more productive because of the irrigation in 1980 and 1981 and thus attracted more cattle, and cattle remained in the area throughout the 1982 growing season; 2) Differences related to data collection - in visual evaluation of species cover it is difficult to be consistent from year to year and even from quadrat to quadrat. The major differences in the results of the shrub sampling can be attributed to the analysis of 16 line-strip transects in 1982 rather than 20 transects analyzed in 1980 and 1981.

Fifteen pairs of range cages and adjacent open areas were sampled in each of the previously mentioned vegetation types. The 1982 data showed slight reductions in both production and utilization for both areas in 1982. The amount of utilization for both areas was significant. Both production and the amount of utilization of the irrigation area were significantly greater than that for the chained pinyon-juniper rangeland.

Any possible effects which irrigation and/or fertilization from previous years might have had on herbaceous biomass in the irrigation/fertilization study plots were completely masked by the heavy cattle utilization throughout the summer of 1982. The amount of herbaceous biomass in all plots was very low and no differences among the plots could be ascertained from the data.

Table 2.5.3-1 Herb quadrat summaries for the Irrigation Study Plot. Based on data from 25 permanently located quadrats. June 1982. Values in percent. "?" indicates uncertain identification. ± values are equal to the standard error of the mean.

Species	Mean Cover (%)	Relative Cover (%)	Range of Cover Values	Frequency (%)
HERBACEOUS SPECIES				
Agoseris glauca	<0.1	0.19	0 - <1	20
Agropyron desertorum	0.1	0.81	0 - 1	12
Agropyron smithii	2.2	21.29	0 - 8	68
Agropyron trachycaulum	0.4	4.31	0 - 4	28
Antennaria rosea	0.5	4.62	0 - 3	32
Aster fendleri	0.2	2.23	0 - 1	52
Astragalus ceramicus	<0.1	0.42	0 - 1	8
Bouteloua gracilis	<0.1	<0.01	0 - <1	4
Bromus tectorum	1.4	13.79	0 - 4	92
Chanactis donglasii	<0.1	0.12	0 - <1	12
Crepis accuminata	<0.1	0.42	0 - 1	8
Cryptantha spp.	<0.1	0.15	0 - <1	16
Erigeron pumilus	<0.1	<0.01	0 - <1	4
Heterotheca villosa	0.3	2.58	0 - 2	44
Koelaria gracilis	0.5	4.39	0 - 2	48
Lappula redowskii	<0.1	<0.01	0 - <1	4
Oryzopsis hymenoides	0.9	8.70	0 - 6	60
Penstemon caespitosus	0.3	2.43	0 - 3	28
Penstemon fremontii	<0.1	<0.01	0 - <1	4
Phlox hoodii	0.3	3.20	0 - 3	32
Phlox longifolia	0.1	0.54	0 - 1	20
Physaria floriburda	<0.1	0.12	0 - <1	12
Poa spp. (fendleriana?)	0.6	6.24	0 - 6	32
Senecio spp.	0.1	0.85	0 - 1	16
Sitanion longifolium	0.5	4.35	0 - 3	48
Sphaeralcea coccinea	0.6	5.78	0 - 5	16
Stipa comata	0.4	4.00	0 - 5	36
Taraxacum officinale	0.2	1.62	0 - 3	16
Tragapogon dubius	0.1	0.85	0 - 2	12
Sub - Total	9.7			

Table 2.5.3-1 Herb quadrat summaries for the Irrigation Study Plot. (Continued)

Species	Mean Cover (%)	Relative Cover (%)	Range of Cover Values	Frequency (%)
WOODY SPECIES				
Artemisia tridentata	0.3	3.04	0 - 3	52
Chrysothamnus nauseosus	<0.1	0.31	0 -<1	32
Chrysothamnus viscidiflorus	<0.1	0.42	0 - 1	8
Gutierrezia sarothrae	0.2	2.08	0 - 4	24
Sub - Total	0.5			
Total Herb Cover	8.8		2 - 16	
Total Woody in Herb Layer	0.6		0 - 4	
Total Shrub Layer Cover	10.4		0 - 45	
Mosses	<0.1		0 - 1	
Lichens	0.2		0 - 2	
Litter	68.7		8 - 98	
Bare soil	20.8		0 - 60	
Rock	3.1		0 - 28	

	Mean ± S.E.	Range
No. of Herb Species/m^2	8.12 ± 0.61	1 - 14
Total No. Species/m^2	9.28 ± 0.67	1 - 15

Table 2.5.3-2 Mean cover, relative cover, frequency, and density for shrub species in the Irrigation intensive study plot. 1982 data. Height Class I = 0.25m-0.75m; Class II = 0.76-1.50m; Class III = 1.51-2.25m; Class IV = >2.25m. Values based on data from 16 10m x 4m line strip transects.

Species	Height Class	Mean Cover (%)	Relative Cover (%)	Frequency (%)	Density (No. of Individuals/ha)
Artemisia tridentata	Total	3.13	36.0	100	1876
	I				1219
	II				641
	III				16
Chrysothamnus nauseosus	Total	<0.01	<0.01	31	79
	I				63
	II				16
Chrysothamnus viscidiflorus	Total	0.17	2.0	69	547
	I				531
	II				16
Juniperus osteosperma	Total	2.25	25.9	69	360
	I				47
	II				172
	III				125
	IV				16
Juniperus scopulorum	Total	0.85	9.8	31	110
	I				63
	II				31
	III				16
Opuntia polyacantha	Total	<0.01	<0.01	25	156
	I				156

Table 2.5.3-2 Mean cover, relative cover, frequency, and density for shrub species in the Irrigation intensive study plot. 1982 data. Height Class I = 0.25m-0.75m; Class II = 0.76-1.50m; Class III = 1.51-2.25m; Class IV = >2.25m. Values based on data from 16 10m x 4m line strip transects.

Species	Height Class	Mean Cover (%)	Relative Cover (%)	Frequency (%)	Density (No. of Individuals/ha)
Pinus edulis	Total	0.67	7.7	69	297
	I				109
	II				109
	III				63
	IV				16
Purshia tridentata	Total	0.63	7.3	13	172
	I				125
	II				47
Ribes spp	Total	0.15	1.7	6	31
	II				31
Symphoricarpus oreophilus	Total	0.83	9.6	31	422
	I				313
	II				109

Table 2.5.3-3 Oven dry weights (grams/m^2) for range cages and adjacent open areas in the chained pinyon-juniper rangeland community type. 1982

	Quadrat Number	*Agropyron smithii*	*Bromus tectorum*	*Oryzopsis hymenoides*	Perennial Grasses	Perennial Forbs	Annual Forbs	Half Shrubs	Total Biomass			
FENCED	61	0.29	1.08	0.83	10.01	2.42	-	-	14.63			
	62	-	0.85	22.42	1.47	39.85	-	-	64.59			
	63	26.22	4.93	0.44	0.17	0.06	0.13	-	31.95			
	64	14.41	-	-	19.22	9.29	-	-	42.92			
	65	10.93	-	2.26	41.84	0.04	-	-	55.07			
	66	28.62	-	-	6.58	11.93	-	-	47.13			
	67	30.66	1.24	3.28	-	0.20	-	-	35.38			
	68	11.95	0.18	-	4.39	24.44	-	-	40.96			
	69	0.55	0.06	-	1.52	82.60	5.66	-	90.39			
	70	24.55	0.02	-	2.61	26.32	-	-	53.50			
	71	9.02	-	7.88	0.98	5.45	-	-	23.33			
	72	-	0.11	1.34	21.63	2.53	-	-	25.61			
	73	-	0.63	10.74	5.33	0.34	-	-	17.04			
	74	14.59	7.59	-	3.89	8.78	-	-	34.85			
	75	-	13.14	1.52	19.66	13.28	0.02	-	47.62			
OPEN	61	0.82	0.96	-	11.31	10.14	0.02	-	23.25			
	62	-	2.80	5.83	1.73	1.00	-	21.84	33.20			
	63	13.03	0.24	0.02	1.78	1.33	-	-	16.40			
	64	4.61	-	-	6.95	4.02	-	-	15.58			
	65	2.92	-	-	7.67	-	0.03	-	10.62			
	66	9.62	-	-	9.58	13.24	0.24	-	32.68			
	67	-	0.05	2.06	19.17	1.34	-	-	22.62			
	68	4.70	0.04	-	6.83	12.71	-	-	24.28			
	69	0.31	0.25	-	3.49	45.46	-	-	49.51			
	70	0.84	0.07	0.16	8.29	2.34	0.06	-	11.76			
	71	0.84	-	-	7.02	7.53	-	-	15.39			
	72	1.58	7.78	-	0.41	4.29	-	-	14.06			
	73	-	1.68	6.35	5.09	3.13	-	-	16.25			
	74	15.95	1.76	-	2.20	5.93	-	-	25.84			
	75	1.91	1.00	0.83	13.89	25.70	-	-	43.33			

Table 2.5.3-4 Oven dry weights (grams/m^2) for range cage and adjacent open areas in the irrigated chained rangeland community type.

	Quadrat Number	*Agropyron smithii*	*Bromus tectorum*	*Oryzopsis hymenoides*	Perennial Grasses	Perennial Forbs	Annual Forbs	Half Shrubs	Total Biomass			
FENCED	1	7.77	1.04	25.79	47.14	1.19	-	-	82.93			
	2	-	0.18	4.36	56.81	2.87	-	-	64.22			
	3	19.44	-	-	63.17	0.34	-	-	83.45			
	4	9.18	-	-	48.89	5.97	-	-	64.04			
	5	2.73	-	-	50.28	9.66	-	-	62.67			
	6	1.87	0.04	20.12	33.49	1.40	-	-	56.92			
	7	31.04	26.31	60.19	37.27	1.48	-	-	156.29			
	8	109.68	-	-	18.12	24.18	-	-	151.98			
	9	-	-	-	53.39	1.37	-	-	54.76			
	10	19.29	-	-	14.25	5.13	-	-	38.67			
	11	54.33	0.52	6.47	5.84	11.44	-	-	78.60			
	12	-	25.13	39.39	11.29	10.96	1.80	-	88.57			
	13	40.90	1.16	-	18.28	0.71	-	-	61.05			
	14	29.97	0.23	-	9.95	7.09	0.02	-	47.26			
	15	41.00	-	-	10.46	11.58	-	-	63.04			
OPEN	1	2.37	0.09	3.44	17.91	0.41	0.04	-	24.26			
	2	-	0.03	0.06	8.89	13.05	0.02	0.43	22.48			
	3	1.65	-	-	17.97	0.23	-	-	19.85			
	4	4.60	-	-	13.86	13.94	-	0.71	33.11			
	5	12.92	-	0.13	12.31	6.54	-	-	31.90			
	6	6.19	0.45	6.76	6.32	3.28	-	-	23.00			
	7	38.44	0.03	4.67	-	0.67	-	-	43.81			
	8	28.33	-	-	14.63	17.21	0.09	-	60.26			
	9	0.89	-	-	9.84	1.38	-	-	12.11			
	10	0.20	0.02	-	14.77	8.60	-	2.04	25.63			
	11	8.21	0.97	6.29	-	6.45	-	-	21.92			
	12	-	9.58	6.11	0.28	14.63	1.33	-	31.93			
	13	7.41	1.12	0.11	11.37	2.31	-	-	22.32			
	14	10.59	-	-	5.09	21.43	-	-	37.11			
	15	14.38	-	-	14.61	2.69	-	-	31.68			

Table 2.5.3-5 Mean production (grams/m^2)± the standard error of the mean (S.E.), frequency, and range of observed values for clipped plots in the chained pinyon-juniper rangeland. 1982 Data.

Species	Mean ± S.E.	Sample Size	Frepuency (%)	Range of Values
OPEN AREAS				
Agropyron smithii	3.81 ± 1.31	15	80	0-15.95
Bromus tectorum	1.11 ± 0.53	15	73	0- 7.78
Oryzopsis hymenoides	1.02 ± 0.55	15	40	0- 6.35
Perennial grasses	7.03 ± 1.31	15	100	0.41-19.17
Perennial forbs	9.21 ± 3.12	15	93	0-45.46
Annual forbs	0.02 ± 0.016	15	27	0- 0.24
Half shrubs	1.46 ± 1.46	15	7	0-21.84
Total Biomass	23.65 ± 2.99	15		10.62-49.51
FENCED PLOTS				
Agropyron smithii	11.45 ± 2.97	15	73	0-30.66
Bromus tectorum	1.99 ± 0.97	15	73	0-13.14
Oryzopsis hymenoides	3.38 ± 1.59	15	60	0-22.42
Perennial grasses	9.29 ± 3.01	15	93	0-41.84
Perennial forbs	15.17 ± 5.68	15	100	0.06-82.60
Annual forbs	0.39 ± 0.38	15	20	0- 5.66
Total Biomass	41.66 ± 5.07	15		14.63-90.39

Table 2.5.3-6 Mean production (grams/m^2) ± the standard error of the mean (S.E.), frequency, and range of observed values for clipped plots in the Irrigated Area. 1982 Data.

Species	Mean ± S.E.	Sample Size	Frequency (%)	Range of Values
OPEN AREAS				
Agropyron smithii	9.08 ± 2.86	15	87	0-38.44
Bromus tectorum	0.82 ± 0.63	15	53	0- 9.58
Oryzopsis hymenoides	1.84 ± 0.71	15	53	0- 6.76
Perennial grasses	9.86 ± 1.61	15	87	0-17.97
Perennial forbs	7.52 ± 1.79	15	100	0.23-21.43
Annual forbs	0.10 ± 0.09	15	27	0- 1.33
Half shrubs	0.21 ± 0.14	15	20	0- 2.04
Total Biomass	29.42 ± 2.99	15		12.11-60.26
FENCED PLOTS				
Agropyron smithii	24.51 ± 7.59	15	80	0-109.68
Bromus tectorum	3.64 ± 2.32	15	53	0- 26.31
Oryzopsis hymenoides	10.42 ± 4.72	15	40	0- 60.19
Perennial grasses	31.91 ± 5.20	15	100	5.84- 63.17
Perennial forbs	6.36 ± 1.67	15	100	0.34- 24.18
Annual forbs	0.12 ± 0.12	15	13	0- 1.80
Total Biomass	76.96 ± 8.83	15		38.67-156.29

Table 2.5.3-7 Fresh weight estimates (grams/0.10 meter) for irrigation/fertilizer study plots. 1982 Data.

Treatment Number	1a														
Fertilizer Level (Lbs/Acre) N,P	0,0														
Year Fertilizer Applied	None Applied														
Sprinkler Time Set	18 hrs														
Quadrat Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Agropyron smithii	4	-	-	-	-	2	<1	-	-	-	5	-	-	-	-
Bromus tectorum	-	1	-	<1	-	<1	<1	<1	-	-	-	-	<1	-	<1
Oryzopsis hymenoides	<1	-	-	-	-	-	-	-	-	-	-	-	1	-	-
Perennial grasses	2	2	1	<1	2	<1	3	2	4	3	-	3	<1	1	1
Perennial forbs	<1	<1	2	2	-	1	1	2	<1	-	1	2	2	1	1
Annual forbs	-	<1	2	-	-	1	-	<1	-	-	-	<1	<1	-	-
Half shurbs	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TOTALS	6	3	5	2	2	4	4	4	4	3	6	5	3	5	2

Treatment Number	1b														
Fertilizer Level (Lbs/Acre) N,P	0,0														
Year Fertilizer Applied	None Applied														
Sprinkler Time Set	12 hrs.														
Quadrat Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Agropyron smithii	-	-	1	4	3	1	-	-	-	1	-	2	1	1	-
Bromus tectorum	<1	<1	-	-	-	-	<1	<1	<1	<1	-	-	-	-	<1
Oryzopsis hymenoides	-	-	-	1	-	-	2	-	<1	-	-	-	-	-	-
Perennial grasses	4	2	3	<1	1	1	-	-	1	2	3	-	1	1	1
Perennial forbs	2	<1	4	<1	1	2	9	6	-	2	1	<1	-	-	4
Annual forbs	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Half shurbs	-	-	-	-	-	-	-	-	-	-	-	1	-	<1	-
TOTALS	6	2	8	5	5	4	11	6	1	5	4	3	2	2	5

Table 2.5.3-7 Fresh weight estimates (grams/0.10 m^2) for irrigation/fertilizer study plots. 1982 Data.

Treatment Number	3a															3a														
Fertilizer Level (lbs/Acre) N,P	100,100															100,100														
Year Fertilizer Applied	1980 only															1980 & 1981														
Sprinkler Time Set	18 hrs.															18 hrs.														
Quadrat Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Agropyron smithii	3	2	4	3	2	5	6	2	7	6	2	4	1	2	6	-	4	1	5	1	2	3	2	3	1	1	5	2	<1	2
Bromus tectorum	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Oryzopsis hymenoides	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Perennial grasses	2	1	<1	-	-	<1	<1	3	<1	1	-	<1	2	1	1	1	1	<1	-	2	<1	3	3	3	3	2	<1	3	2	4
Perennial forbs	2	<1	5	<1	-	<1	-	-	-	1	<1	<1	-	<1	2	-	-	<1	-	-	-	-	-	<1	-	-	-	1	-	-
Annual forbs	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Half shrubs	-	-	-	-	3	-	-	-	-	-	-	1	-	-	-	-	<1	-	1	<1	-	-	-	-	-	-	<1	-	-	<1
TOTALS	7	3	9	3	5	5	6	5	7	8	2	5	3	2	9	1	5	1	6	2	2	6	5	6	4	3	5	5	2	6

Table 2.5.3-7 Fresh weight estimates (grams/0.10 m^2) for irrigation/firtilizer study plots. 1982 Data.

Treatment Number	3b															3b														
Fertilizer Level (Lbs/Acre) N,P	100,100															100,100														
Year Fertilizer Applied	1980 only															1980 & 1981														
Sprinkler Time Set	12 hrs.															12 hrs.														
Quadrat Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Agropyron smithii	-	-	-	-	2	-	3	-	3	1	2	-	-	<1	-	-	2	-	3	-	3	-	-	-	-	-	4	3	2	-
Bromus tectorum	<1	1	<1	<1	<1	-	-	<1	-	-	-	-	-	-	-	1	-	-	-	-	-	<1	-	-	-	<1	-	-	<1	<1
Oryzopsis hymenoides	-	2	-	-	-	1	-	2	-	1	-	-	-	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3
Perennial grasses	3	<1	2	4	1	4	1	-	-	-	-	4	3	-	2	1	4	1	<1	1	<1	2	<1	7	4	2	2	1	2	1
Perennial forbs	<1	-	-	-	<1	3	1	2	-	3	2	<1	1	2	2	<1	-	6	2	-	<1	2	2	-	1	-	1	1	<1	1
Annual forbs	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	-
Half shrubs	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-
TOTALS	3	3	2	4	3	8	5	4	3	5	4	4	4	2	4	3	7	7	5	1	3	4	2	7	5	2	7	5	4	5

Table 2.5.3-7 Fresh weight estimates (grams/0.10 m^2) for irrigation/fertilizer study plots. 1982 Data. added in 1980 only.

Treatment Number	4a															4a														
Fertilizer Level (Lbs/Acre) N,P	200,100															200,100														
Year Fertilizer Applied	1980 only															1980 &1981														
Sprinkler Time Set	18 hrs.															18 hrs.														
Quadrat Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Agropyron smithii	4	2	1	2	<1	1	1	2	3	4	1	<1	<1	<1	2	2	-	-	1	1	-	2	3	2	<1	<1	2	1	<1	<1
Bromus tectorum	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Oryzopsis hymenoides	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Perennial grasses	1	<1	2	<1	2	1	3	1	2	-	3	4	2	2	3	4	3	4	3	4	5	4	2	2	3	3	2	3	4	2
Perennial forbs	<1	2	-	<1	1	<1	1	-	-	1	-	<1	1	2	-	-	1	2	-	2	-	-	-	-	-	-	1	1	-	-
Annual forbs	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Half shrubs	-	-	2	-	1	-	1	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
TOTALS	5	4	5	2	4	2	6	6	5	5	4	4	3	4	5	6	4	6	4	7	5	6	5	5	3	3	4	5	4	2

Table 2.5.3-7 Fresh weight estimates (grams/0.10 m^2) for irrigation/fertilizer study plots. 1982 Data.

Treatment Number	4b														
Fertilizer Level (Lbs/Acre) N,P	200,100														
Year Fertilizer Applied	1980 only														
Sprinkler Time Set	12 hrs.														
Quadrat Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Agropyron smithii	2	1	3	-	3	1	3	-	-	6	2	<1	-	4	2
Bromus tectorum	-	<1	<1	<1	-	-	-	-	1	-	-	-	<1	-	<1
Oryzopsis hymenoides	-	-	-	2	-	-	-	-	1	-	-	-	3	-	-
Perennial grasses	2	2	1	-	-	1	1	<1	1	1	-	4	1	<1	2
Perennial forbs	1	-	-	1	-	2	1	<1	2	1	2	-	1	-	1
Annual forbs	-	<1	-	<1	-	-	-	-	-	-	-	-	-	<1	-
Half shrubs	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TOTALS	5	3	4	3	3	4	5	-	5	8	4	4	5	4	4

Treatment Number	4b														
Fertilizer Level (Lbs/Acre) N,P	200,100														
Year Fertilizer Applied	1980 & 1981														
Sprinkler Time Set	12 hrs.														
Quadrat Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Agropyron smithii	1	1	2	1	3	4	-	1	-	3	-	2	2	1	4
Bromus tectorum	-	-	<1	<1	1	1	<1	<1	1	-	<1	-	-	1	-
Oryzopsis hymenoides	-	-	-	1	-	-	-	1	1	-	<1	-	-	-	-
Perennial grasses	<1	3	1	<1	-	-	1	1	1	<1	<1	-	1	<1	<1
Perennial forbs	<1	<1	<1	<1	-	-	-	<1	2	-	5	3	<1	-	-
Annual forbs	2	-	1	-	<1	-	<1	-	-	<1	-	-	<1	-	<1
Half shrubs	-	-	-	-	-	-	-	4	-	-	-	-	-	-	1
TOTALS	3	4	4	2	4	5	1	7	5	3	5	5	3	2	5

Table 2.5.3-8 Oven dry weights (grams/0.10m^2) for herbaceous biomass in fertilizer and irrigation treatments for irrigation study plots. 1982 Data.

Treatment Number	Quadrat Number	*Agropyron smithii*	*Bromus tectorum*	*Oryzopsis hymenoides*	Perennial Grasses	Perennial Forbs	Annual Forbs	Half Shrubs	Total Biomass		
1a	1	1.10	-	0.05	0.41	0.02	-	-	1.58		
1a	6	0.64	0.04	-	0.29	0.22	0.26	-	1.45		
1a	13	-	0.03	0.64	0.39	0.63	0.02	-	1.71		
1b	1	-	0.02	-	3.33	0.54	-	-	3.89		
1b	7	-	0.32	1.26	-	5.46	-	-	7.04		
3a '80	1	2.33	-	-	1.68	1.00	-	-	5.01		
3a '80	9	3.34	-	-	0.06	-	-	-	3.40		
3a '80&'81	1	-	-	-	0.48	-	0.02	-	0.50		
3a 80&'81	4	3.60	-	-	-	-	-	0.31	3.91		
3b 80	1	-	0.36	-	1.84	0.02	0.02	-	2.24		
3b 80	6	-	-	0.63	2.40	1.91	-	-	4.94		
3b 80 & 81	1	-	0.39	-	0.69	0.02	-	0.45	1.55		
3b 80 &81	6	1.50	-	-	0.04	0.04	-	-	1.58		
4a 80	1	1.84	-	-	0.67	0.10	-	-	2.61		
4a 80	8	0.83	-	-	0.62	-	-	2.35	3.80		
4a 80 & 81	1	0.32	-	-	2.39	-	-	-	2.71		
4a 80 & 81	9	0.89	-	-	0.54	-	-	0.19	1.62		
4b 80 & 81	2	0.59	-	-	1.04	0.05	-	-	1.68		
4b 80 & 81	8	0.40	0.17	0.38	0.44	0.02	-	1.99	3.40		

Table 2.5.3-9 Regression Equations for converting fresh weight estimates to oven dry weights in the irrigation/fertilization study plots. 1982 Data.

Species/ Species Group	Regression Equations	Correlation Coefficient
Agropyron smithii	$y = 0.47x - 0.07$	0.93
Bromus tectorum	$y = 0.26x + 0.13$	0.53
Oryzopsis hymenoides	$y = 0.64x - 0.06$	0.97
Perennial grasses	$y = 0.60x - 0.02$	0.89
Perennial forbs	$y = 0.60x - 0.14$	0.98
Annual forbs	$y = 0.27x - 0.01$	1.00
Half shrubs	$y = 0.71x - 0.25$	0.89

Table 2.5.3-10 Mean production ± the standard error of the mean (S.E.), frequency, and range of observed values for quadrats in the irrigation/fertilization study plots 1a, 1b, 3a, 3b, 4a, and 4b. Based on data derived from regression equations. Production values in grams/0.10m^2.

Species/ Species Group	Mean ± S.E.	Sample Size	Frequency (%)	Range of Values
UNFERTILIZED				
Site 1a				
Agropyron smithii	0.42 ± 0.20	15	33	0-2.26
Bromus tectorum	0.09 ± 0.03	15	47	0-0.39
Oryzopsis hymenoides	0.04 ± 0.04	15	13	0-0.58
Perennial grasses	0.95 ± 0.20	15	93	0-2.39
Perennial forbs	0.51 ± 0.11	15	87	0-1.06
Annual forbs	0.06 ± 0.04	15	40	0-0.53
Total Biomass	2.07 ± 0.15	15	100	1.18-3.02
Site 1b				
Agropyron smithii	0.40 ± 0.14	15	53	0-1.80
Bromus tectorum	0.07 ± 0.02	15	47	0-0.16
Oryzopsis hymenoides	0.12 ± 0.09	15	20	0-1.22
Perennial grasses	0.79 ± 0.19	15	80	0-2.39
Perennial forbs	1.17 ± 0.40	15	80	0-5.30
Half shrubs	0.03 ± 0.03	15	13	0-0.47
Total Biomass	2.58 ± 0.51	15	100	0.76-6.68

Table 2.5.3-10 Mean production ± the standard error of the mean (S.E.), frequency, and range of observed values for quadrats in the irrigation/fertilization study plots 1a, 1b, 3a, 3b, 4a, and 4b. Based on data derived from regression equations. Production values in grams/0.10m^2.

Species/ Species Group	Mean ± S.E.	Sample Size	Frequency (%)	Range of Values
FERTILIZED 1980				
Site 3a				
Agropyron smithii	1.64 ± 0.23	15	100	0.40-2.73
Perennial grasses	0.44 ± 0.14	15	80	0-1.78
Perennial forbs	0.37 ± 0.20	15	67	0-2.88
Half shrubs	0.16 ± 0.13	15	13	0-1.90
Total Biomass	2.62 ± 0.30	15	100	0.89-4.72
Site 3b				
Agropyron smithii	0.32 ± 0.13	15	40	0-1.33
Bromus tectorum	0.08 ± 0.03	15	40	0-0.39
Oryzopsis hymenoides	0.24 ± 0.11	15	33	0-1.22
Perennial grasses	0.95 ± 0.25	15	67	0-2.39
Perennial forbs	0.57 ± 0.16	15	73	0-1.67
Annual forbs	0.001 ± 0.001	15	7	0-0.001
Total Biomass	2.17 ± 0.22	15	100	1.10-4.64
Site 4a				
Agropyron smithii	0.67 ± 0.17	15	100	0.02-1.80
Perennial grasses	1.03 ± 0.19	15	93	0-2.39
Perennial forbs	0.27 ± 0.10	15	67	0-1.06
Half shrubs	0.32 ± 0.19	15	27	0-2.62
Total Biomass	2.29 ± 0.20	15	100	0.93-4.07

Table 2.5.3-10 Mean production ± the standard error of the mean (S.E.), frequency, and range of observed values for quadrats in the irrigation/fertilization study plots 1a, 1b, 3a, 3b, 4a, and 4b. Based on data derived from regression equations. Production values in grams/0.10m^2.

Species/ Species Group	Mean ± S.E.	Sample Size	Frequency (%)	Range of Values
Site 4b				
Agropyron smithii	0.80 ± 0.21	15	73	0-2.73
Bromus tectorum	0.08 ± 0.03	15	40	0-0.39
Oryzopsis hymenoides	0.24 ± 0.14	15	20	0-1.86
Perennial grasses	0.63 ± 0.17	15	80	0-2.39
Perennial forbs	0.40 ± 0.10	15	67	0-1.06
Annual forbs	0.004 ± 0.002	15	20	0-0.02
Total Biomass	2.15 ± 0.21	15	100	0.06-3.77
FERTILIZED IN 1980 &1981				
Site 3a				
Agropyron smithii	0.85 ± 0.20	15	93	0-2.26
Perennial grasses	1.07 ± 0.21	15	93	0-2.39
Perennial forbs	0.03 ± 0.03	15	20	0-0.46
Annual forbs	0.001 ± 0.001	15	7	0-0.02
Half Shrubs	0.04 ± 0.03	15	33	0-0.47
Total Biomass	2.00 ± 0.24	15	100	0.46-3.13
Site 3b				
Agropyron smithii	0.50 ± 0.17	15	40	0-1.80
Bromus tectorum	0.07 ± 0.03	15	33	0-0.39
Oryzopsis hymenoides	0.12 ± 0.12	15	7	0-1.86
Perennial grasses	1.11 ± 0.29	15	100	0.04-4.20
Perennial forbs	0.57 ± 0.23	15	73	0-3.48
Annual forbs	0.001 ± 0.001	15	7	0-0.02
Half shrubs	0.06 ± 0.04	15	13	0-0.47
Total Biomass	2.44 ± 0.29	15	100	0.58-4.20

Table 2.5.3-10 Mean production ± the standard error of the mean (S.E.), frequency, and range of observed values for quadrats in the irrigation/fertilization study plots 1a, 1b, 3a, 3b, 4a, and 4b. Based on data derived from regression equations. Production values in grams/0.10m^2.

Species/ Species Group	Mean ± S.E.	Sample Size	Frequency (%)	Range of Values
Site 4a				
Agropyron smithii	0.41 ± 0.12	15	80	0-1.33
Perennial grasses	1.90 ± 0.15	15	100	0.04-2.99
Perenneal forbs	0.23 ± 0.10	15	33	0-1.06
Half shrubs	0.03 ± 0.03	15	7	0-0.47
Total Biomass	2.57 ± 0.18	15	100	1.20-3.85
Site 4b				
Agropyron smithii	0.72 ± 0.16	15	80	0-1.84
Bromus tectorum	0.16 ± 0.04	15	60	0-0.39
Oryzopsis hymenoides	0.12 ± 0.06	15	27	0-0.58
Perennial grasses	0.33 ± 0.12	15	80	0-1.78
Perennial forbs	0.38 ± 0.22	15	60	0-2.88
Annual forbs	0.06 ± 0.04	15	47	0-0.53
Half shrubs	0.21 ± 0.18	15	13	0-2.62
Total Biomass	1.97 ± 0.25	15	100	0.76-4.36

2.5.4 Threatened and Endangered Species

No additional sightings were conducted during this reporting period.

2.5.5 Revegetation

Revegetation studies conducted during 1982 were limited to an analysis of cover for the Revegetation of Raw Shale Demonstration Plot established in the fall of 1981. Other areas on Tract which require an analysis of revegetation are the revegetated Topsoil Storage Piles. However, these areas are not sampled until the third growing season, and none of the Topsoil Piles were in their third year in 1982.

The demonstration plot consists of a portion of the raw shale disposal embankment which is covered with topsoil. The topsoil varies in depth from 18 inches to 6 inches. The plot is subdivided into three sections: 18 inches of topsoil, 12 inches of topsoil, and 6 inches of topsoil. Each section was sampled separately to estimate vegetative cover for the respective topsoil depths.

An estimate of ground cover for each of the topsoil depths was obtained by using the point-intercept method as described in the Office of Surface Mining Publication: "A Survey of Techniques for Measurement of Herbaceous and Shrub Production, Cover and Diversity on Coal Lands in the West"; Bonham, Charles D., Larry L. Larson and Ann Morrison; January 31, 1980; 79 p. This method was used rather than the ocular-estimation method (used on the intensive study plots) in order to attempt to eliminate the tendency for the observer to over estimate ground cover using the ocular method.

An estimate of cover was obtained by sampling 20 one-meter transects per each topsoil depth. The results of sampling are presented in Table 2.5.5-1. Frequency was measured along with cover. The vegetative cover for 18 inches of topsoil depth was 7.95%, for 12 inches of topsoil was 7.65%, and for 6 inches of topsoil depth was 7.20%.

Table 2.5.5-1 Transect summaries for revegetation of raw shale demonstration plot. Based on data derived from 20 point-intercept-transects per each topsoil cover depth. Each transect being 1 meter in length with a possible point inercept at each centimeter, making a total of 100 sample points per individual transect. Data collected July, 1982.

Species Group[1]	Mean Cover (%)	Relative Cover (%)	Frequency (%)
Raw Shale with 18 inches Topsoil Depth			
Perennial Grasses	5.85	73.8	100
Annual Grasses	0.15	1.9	15
Perennial Forbs	1.20	15.1	70
Annual Forbs	0.60	7.5	35
Shrub Seedlings	0.15	1.9	10
Sub-total[2]	7.95		
Bare Ground	2.25		
Rock	0.60		
Litter (mulch)	97.15		
Raw Shale with 12 inches Topsoil Depth			
Perennial Grasses	5.75	75.2	100
Annual Grasses	0.25	3.3	15
Perennial Forbs	1.15	15.0	65
Annual Forbs	0.35	4.6	15
Shrub Seedlings	0.15	1.9	10
Sub-total[2]	7.65		
Bare Ground	1.8		
Rock	0.3		
Litter (mulch)	97.9		
Raw Shale with 6 inches Topsoil Depth			
Perennial Grasses	4.90	68.1	100
Annual Grasses	0.10	1.4	10
Perennial Forbs	1.30	18.0	60
Annual Forbs	0.80	11.1	40
Shrub Seedlings	0.10	1.4	10
Sub-total[2]	7.20		
Litter (mulch)	100.00		

[1] Many of the species were still in a vegetative stage of growth making identification of species difficult. Therefore, rather than risk making incorrect identification the vegetation was grouped into the listed species group.

[2] Sub-totals are equal to the mean total vegetative cover for the respective topsoil depth treatments.

SOIL SURVEY
& PRODUCTIVITY
ASSESSMENT

2.5.6 Soil Survey and Productivity Assessment

No additional studies were conducted during this report period.

DENDROCHRONOLOGY &
DENDROCLIMATOLOGY
STUDIES

2.5.7 Dendrochronology and Dendroclimatology Studies

No additional studies were conducted during this report period.

ARCHAEOLOGICAL
STUDIES

2.6 Archaeological Studies

No additional studies were conducted during this report period.

INDUSTRIAL HEALTH
& SAFETY

2.7 Industrial Health and Safety

Periodic reports on Health and Safety Activities have been requested by the Deputy Conservation Manager. Accident Frequency and Mine Gas Monitoring summaries for this reporting period (June 1982 - December 1982) are presented in this section.

ACCIDENT FREQUENCY

2.7.1 Accident Frequency

Data presented in this section are provided by the Health and Safety Department. Table 2.7.1-1 presents the basic man hours, accident and injury rate data for the period from January, 1982 through December 1982. MSHA inspection reports and citations are on file and are available upon request.

TABLE 2.7.1-1

1982	OCCIDENTAL									CONTRACTOR									OXY & CONTR.								
	MAN HOURS			ACCIDENTS				I.R.		MAN HOURS			ACCIDENTS				I.R.		MAN HOURS			ACCIDENTS				I.R.	
	MONTH	Y.T.D.	QRTR	mon RA	ytd RA	mon LTA	ytd LTA	mon IR	ytd IR	MONTH	Y.T.D.	QRTR.	mon RA	ytd RA	mon LTA	ytd LTA	mon IR	ytd IR	MONTH	Y.T.D.	QRTR.	mon RA	ytd RA	mon LTA	ytd LTA	mon IR	ytd IR
JAN.	16,339	16,339		0	0	0	0	0	0	*			0	0	0	0	*										
FEB.	12,197	28,536		0	0	0	0	0	0	*			1	1	0	0	*										
** MAR	61,899	90,435		0	0	0	0	0	0	*			0	1	0	0	*										
** APR	88,706	179,141		0	1	0	1	0	2.3	94,431			3	4	0	0	4.6										
** MAY	11,833	190,974		0	1	0	1	0	1.8	129,440			4	8	0	0	0	4.6									
JUN	CB 7,245.5	198,218.5	21,608	o	1	1	2	*	*	*			0	8	0	0	0	4.6									
	GJ 9,277.8	207,496.3	95,453																								
JUL	CB Only 4,669	212,165.3		0	1	0	2	*	*	*			0	8	0	0	0	4.6									
	GJ 8,999.2	221,164.5																									
AUG	CB Only 4,669	225,833.5		0	1	0	2	*	*	*			0	8	0	0	0	4.6									
	GJ 8,128	233,961.5																									
SEP	CB Only 4,670	238,631.5	14,008	0	1	0	2	*	*	*			0	8	0	0	0	4.6									
	GJ 7,258	245,889.5	24,385.2																								
OCT	CB 6,164.5	252,054		0	1	0	2	*	*	*			0	8	0	0	0	4.6									
	GJ 5,944.5	257,998.5																									
NOV	CB 7,506	265,504.5		0	1	0	2	*	*	*			0	8	0	0	0	4.6									
	GJ 4,732	270,236.5																									
DEC	CB 3,954	269,458.5		0	1	0	2	*	*	*			0	8	0	0	0	4.6									
	GJ 11,654	281,890.5																									

** Includes personnel located at C-b Tract and administrative offices in Grand Junction (Cathedral Bluffs Shale Oil Company)
* Data not available

MINE GAS
MONITORING

2.7.2 Mine Gas Monitoring

Mine gas samples for CO and methane analysis are required to be taken once every 24 hours from the exhaust air of the Ventilatiion/Escape shaft. These 24-hour values were summarized into weekly averages. All values were 0.0 for June 8 through December 28, 1982.

3.0 Other Studies

Data were collected for two programs for the period June, 1982 through December, 1982. These programs were Micro-environmental Studies and Traffic Load Studies.

3.1 Micro-Climate Program

Introduction

Locations of micro-climate stations with a BC## computer code are presented in Figure 3.1-1.

Micro-climatic parameters monitored from June, 1982 - December, 1982 include the following: 1) Maximum and minimum temperature at surface and at one meter (Table 3.1-1); and 2) Totals for precipitation, snow depth and snow moisture, (Table 3.1-2 and 3.1-3, respectively). Time series plots for the micro-climate parameters are displayed on Figures 3.1-2 through 3.1-6. Snow depth and moisture statistics are shown on Table 3.1-4. Analyses of the micro-climate monitoring program will be included in the Annual Report.

Scope

Studies of micro-climatic parameters on the C-b Tract provide data that are useful in assessing changes in vegetation production and structure, animal populations, or animal activity patterns, and may also be correlated with changes in functional components of the C-b ecosystem that may occur as a result of shale oil development. Five micro-climatic stations are located in developmental sites and five in control sites:

The following sites are monitored:

MC Station Locations

BC01	Chained Pinyon-Juniper Rangeland, Veg. Plot 1
BC02	Chained Pinyon-Juniper Rangeland, Veg. Plot 2
BC03	Plateau Sagebrush, Veg. Plot 3
BC04	Valley Bottom Sagebrush, Veg. Plot 4
BC05	Pinyon-Juniper Woodland, Veg. Plot 5
BC06	Pinyon-Juniper Woodland, Veg. Plot 6
BC07	Chained Pinyon-Juniper Rangeland (Animal Trapping Transect)
BC08	Bunchgrass Community, South-facing Slope
BC09	Valley Bottom Sagebrush, Mouth of Sorghum Gulch
BC13	Mixed Mountain Shrubland, North-facing Slope

Temperature readings consist of maximum and minimum readings for two-week periods. Precipitation is measured only during the growing season, March through October. Therefore, precipitation data from meteorology station AA23 are utilized for winter-month readings (November-February) for valley and pinyon-juniper microclimate stations. Snow measurements are obtained approximately from November-February.

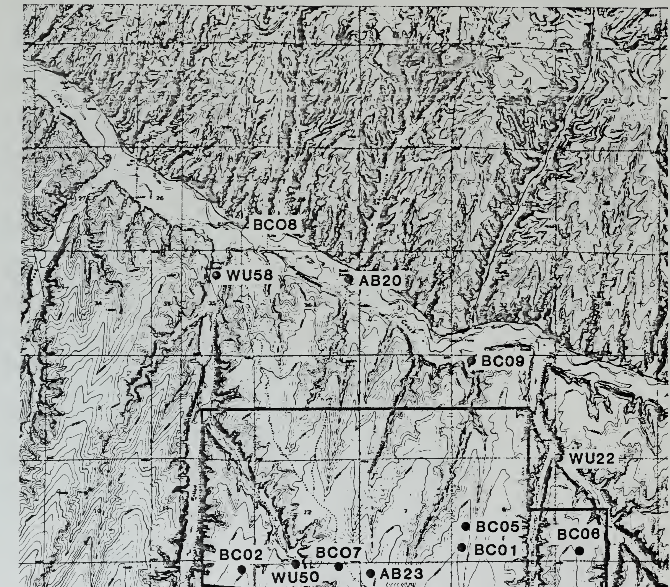

BC08
WU58
AB20
BC09
WU22
BC05
BC06
BC01
BC02
BC07
WU50
AB23
BC04
BC13
WU15
BC03
N
1 Mile
WU70
ON SCANDARD GULCH
AT ROAN PLATEAU

FIGURE 3.1-1
CLIMATOLOGICAL NETWORK NEAR TRACT

TABLE 3.1-1

MICROCLIMATE DATA

AIR SURFACE TEMPERATURES OF MAXIMUM AND MINIMUM VALUES

JUNE 1982 - DECEMBER 1982

STATION	YEAR	MONTH	DAY	TEMP MAXIMUM	TEMP MINIMUM	SURFACE TEMP MAXIMUM	SURFACE TEMP MINIMUM
BC01	82	12	15	7.0	-14.0	6.0	-12.0
BC03	82	7	14	32.0	11.0	40.0	11.0
			30	22.0	10.0	46.0	15.0
		8	16	32.0	12.0	43.0	14.0
		9	15	28.0	-2.0	42.0	7.0
			30	.0	-2.0	35.0	2.0
		10	15	15.0	-9.0	28.0	-3.0
		11	1	17.0	-8.0	32.0	-6.0
			15	5.0	-15.0	23.0	-13.0
		12	1	2.0	-5.0	17.0	-15.0
			15	1.0	-13.0	11.0	-12.0
BC05	82	6	30	40.0	2.0	40.0	5.0
		7	14	40.0	-1.0	39.0	2.0
			30	44.0	7.0	33.0	9.0
		8	16	31.0	10.0	40.0	7.0
		9	1	36.0	6.0	36.0	7.0
			15	36.0	-1.0	32.0	2.0
			30	36.0	1.0	25.0	2.0
		10	15	21.0	-10.0	18.0	-3.0
		11	1	22.0	-11.0	23.0	-10.0
			15	13.0	-16.0	9.0	-15.0
		12	1	10.0	-17.0	10.0	-16.0
BC07	82	6	30	32.0	2.0	36.0	1.0
		7	14	34.0	-2.0	40.0	-1.0
			30	38.0	7.0	38.0	6.0
		8	16	36.0	7.0	35.0	6.0
		9	1	35.0	6.0	36.0	6.0
			15	32.0	-2.0	35.0	-1.0
			30	31.0	.0	24.0	2.0
		10	15	19.0	-12.0	20.0	-9.0
		11	1	17.0	-11.0	24.0	-12.0
			15	10.0	-18.0	15.0	-19.0
		12	1	5.0	-19.0	14.0	-20.0
			15	2.0	-16.0	8.0	-17.0
BC09	82	6	30	35.0	-4.0	42.0	-1.0
		7	14	32.0	4.0	36.0	1.0
			30	37.0	1.0	44.0	3.0
		8	16	34.0	3.0	41.0	5.0
		9	1	34.0	.0	36.0	2.0

TABLE 3.1-1 (Contd)

MICROCLIMATE DATA

AIR SURFACE TEMPERATURES OF MAXIMUM AND MINIMUM VALUES

JUNE 1982 - DECEMBER 1982

STATION	YEAR	MONTH	DAY	TEMP MAXIMUM	TEMP MINIMUM	SURFACE TEMP MAXIMUM	SURFACE TEMP MINIMUM
RC09	82	9	15	31.0	-11.0	36.0	-1.0
			30	26.0	-5.0	30.0	-1.0
		10	15	20.0	-16.0	24.0	-12.0
		11	1	15.0	-14.0	25.0	-14.0
			15	12.0	-25.0	15.0	-18.0
		12	1	10.0	-25.0	13.0	-20.0
			15	8.0	-23.0	10.0	-18.0

TABLE 3.1-2

MICROCLIMATE DATA

PRECIPITATION VALUES

JUNE 1982 - DECEMBER 1982

STATION	YEAR	MONTH	DAY	PRECIPITATION
BC03	82	6	30	.03
		7	14	.04
			30	.87
		8	16	.95
		9	1	.32
			15	1.95
			30	1.54
		10	15	1.00
		11	1	.74
			15	.70
BC05	82	6	30	.13
		7	14	.20
			30	.62
		8	16	1.30
		9	1	.34
			15	1.25
			30	.58
		10	15	.70
		11	1	.52
			15	.60
BC07	82	6	30	.17
		7	14	.30
			30	.72
		8	16	1.50
		9	1	.51
			15	2.00
			30	1.25
		10	15	2.00
		11	1	.64
			15	.64
BC09	82	6	30	.10
		7	14	.34
			30	.50
		8	15	.95
		9	1	.20
			15	1.50
			30	.72
		10	15	.55
		11	1	.44
			15	.54

NOTE: 800.0 = TRACE OF PRECIPITATION

TABLE 3.1-3

MICROCLIMATE DATA

SNOW DEPTH AND SNOW MOISTURE VALUES

JUNE 1982 - DECEMBER 1982

STATION	YEAR	MONTH	DAY	SNOW DEPTH	SNOW MOISTURE
BC01	82	12	15	.0	.0
				.0	.0
				.0	.0
				.0	.0
				.0	.0
				.0	.0
BC03	82	12	1	15.4	2.2
			15	24.0	4.0
				24.0	4.0
				18.0	5.0
				20.0	5.0
				18.0	2.0
				20.8	5.0
BC05	82	12	1	4.0	.8
BC07	82	12	1	7.2	.4
			15	6.0	.0
				8.0	.0
				10.0	1.0
				12.0	3.0
				16.0	3.0
				10.4	1.4
BC09	82	12	1	800.0	.0
			15	6.0	1.0
				10.0	1.0
				800.0	.0
				6.0	1.0
				6.0	1.0
				5.5	.8

NOTE: 800.0 = TRACE OF PRECIPITATION

FIGURE 3.1-2

TIME SERIES PLOT – MAXIMUM AND MINIMUM SURFACE TEMPERATURE

STATION=BC01

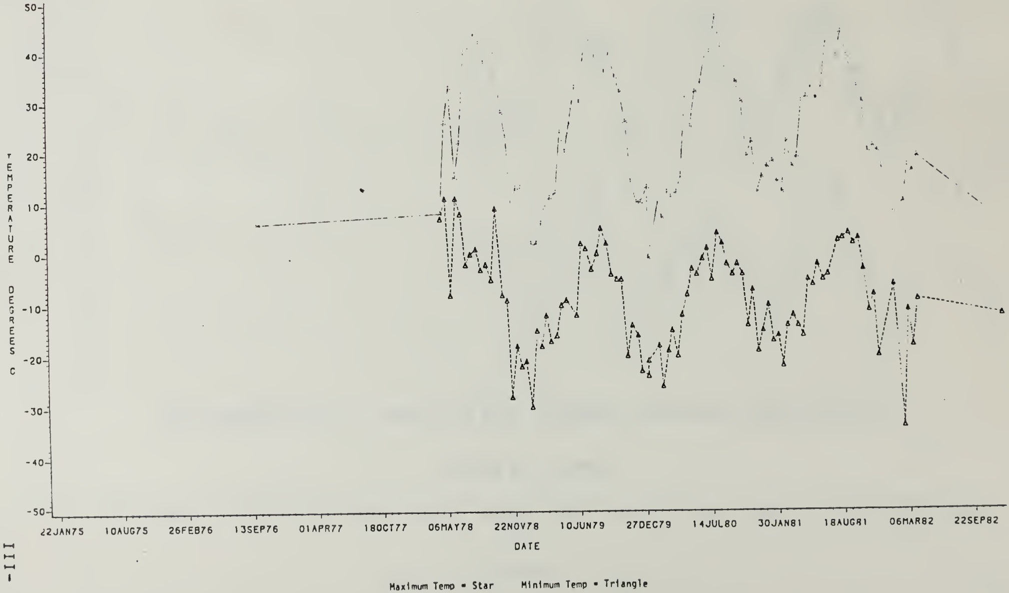


FIGURE 3.1-2 (Contd)

TIME SERIES PLOT – MAXIMUM AND MINIMUM SURFACE TEMPERATURE

STATION=BC02

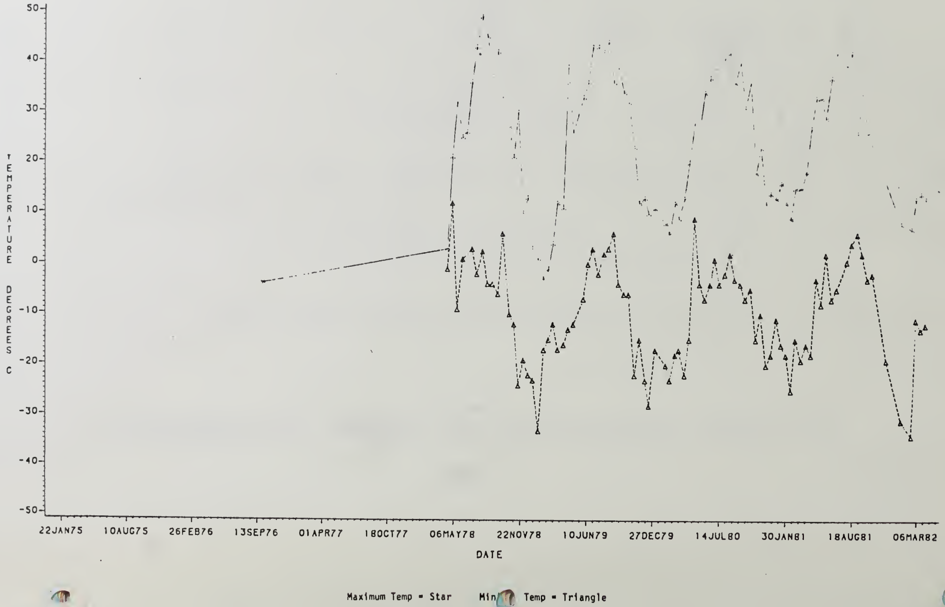


FIGURE 3.1-2 (Contd)

TIME SERIES PLOT — MAXIMUM AND MINIMUM SURFACE TEMPERATURE
STATION=BC03

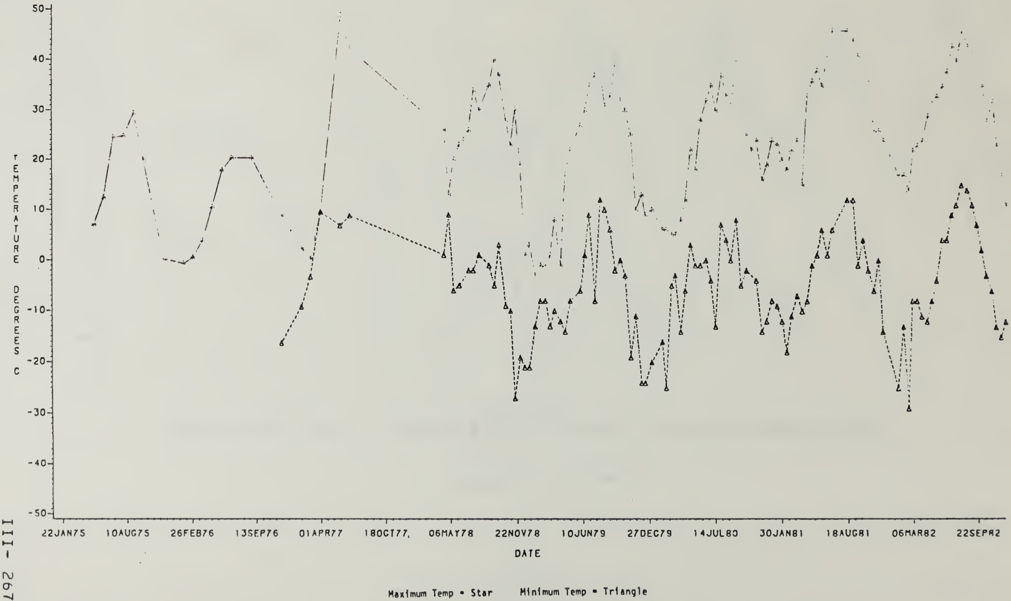


FIGURE 3.1-2 (Contd)

TIME SERIES PLOT – MAXIMUM AND MINIMUM SURFACE TEMPERATURE

STATION=BC04

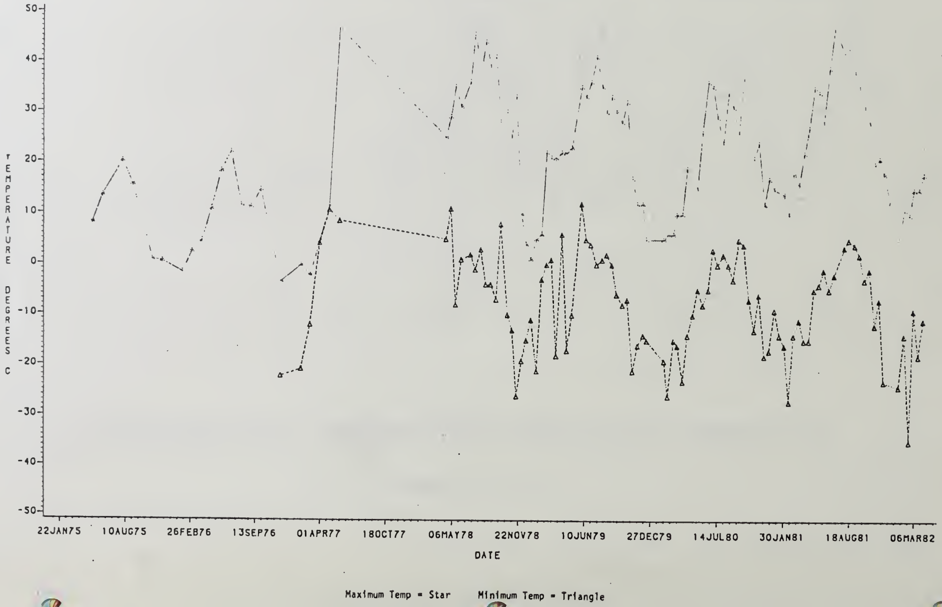


FIGURE 3.1-2 (Contd)

TIME SERIES PLOT – MAXIMUM AND MINIMUM SURFACE TEMPERATURE

STATION=BCOS

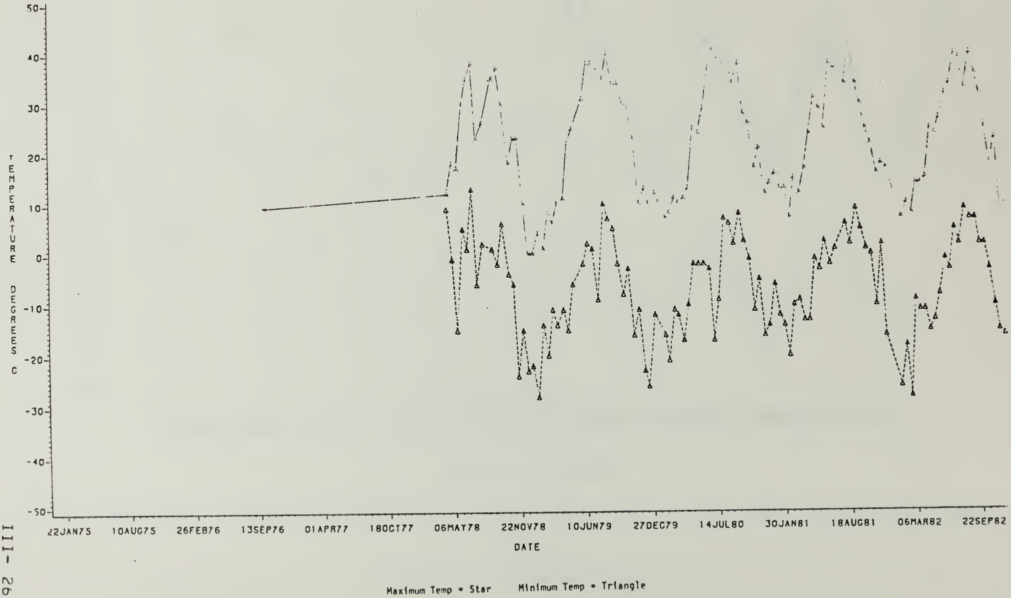


FIGURE 3.1-2 (Contd)

TIME SERIES PLOT – MAXIMUM AND MINIMUM SURFACE TEMPERATURE
STATION=BC06

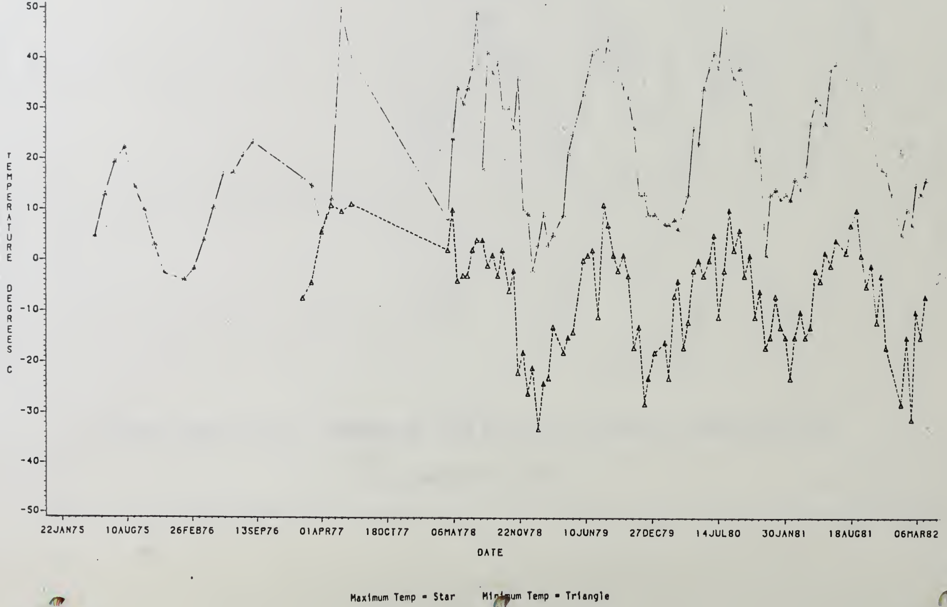


FIGURE 3.1-2 (Contd)

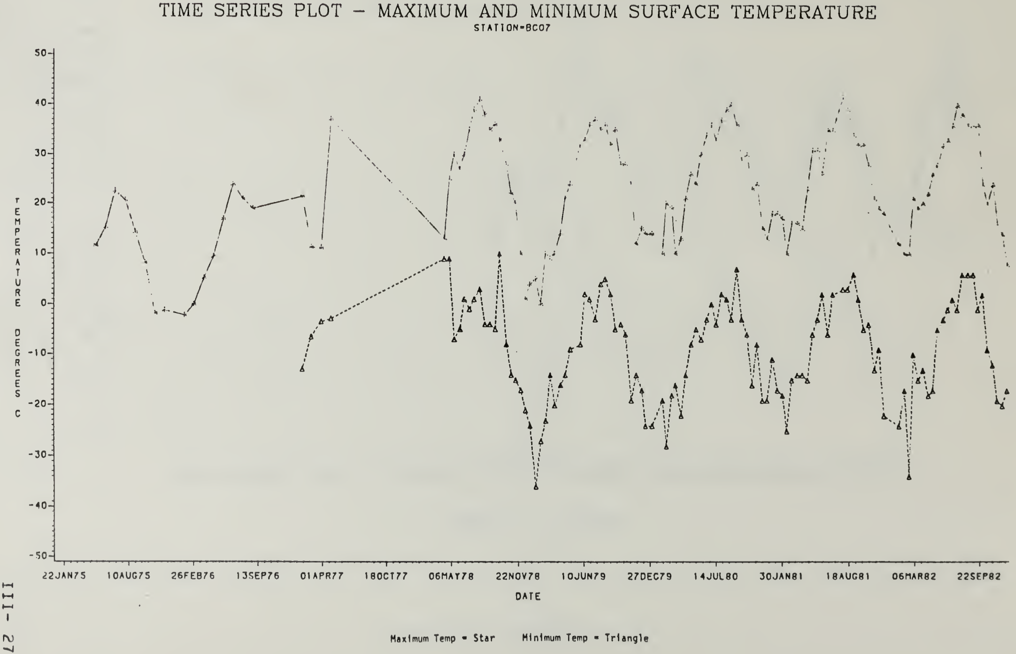


FIGURE 3.1-2 (Contd)

TIME SERIES PLOT – MAXIMUM AND MINIMUM SURFACE TEMPERATURE

STATION=BC08

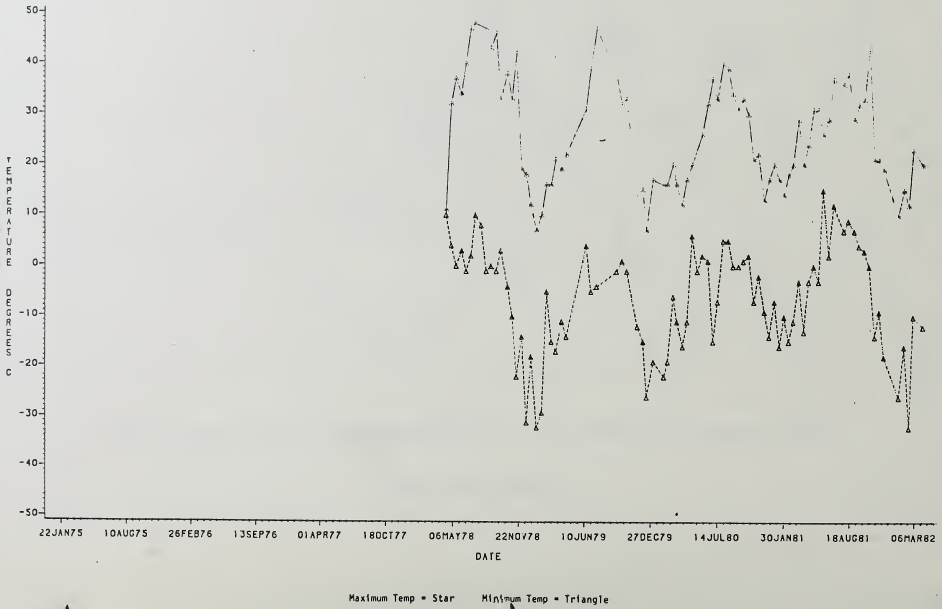


FIGURE 3.1-2 (Contd)

TIME SERIES PLOT — MAXIMUM AND MINIMUM SURFACE TEMPERATURE

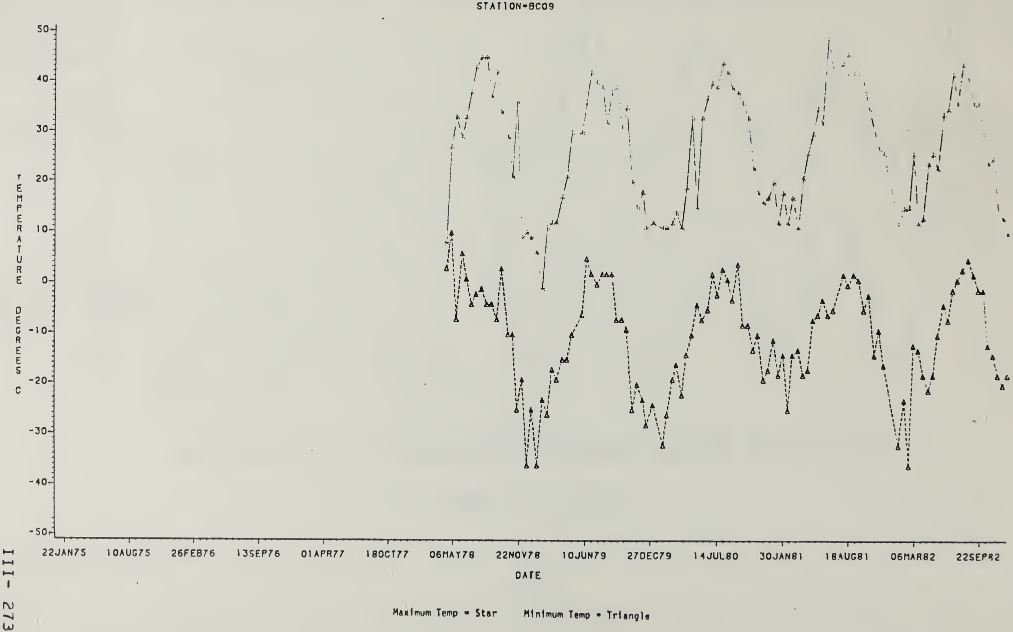


FIGURE 3.1-2 (Contd)

TIME SERIES PLOT — MAXIMUM AND MINIMUM SURFACE TEMPERATURE
STATION=8C13

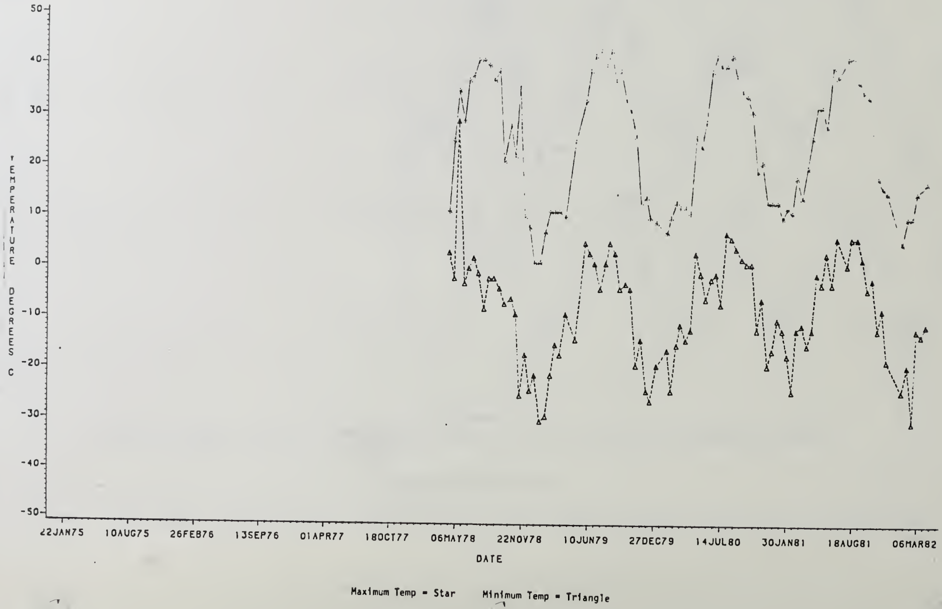


FIGURE 3.1-3

TIME SERIES PLOT – MAXIMUM AND MINIMUM TEMPERATURE
STATION=BC01

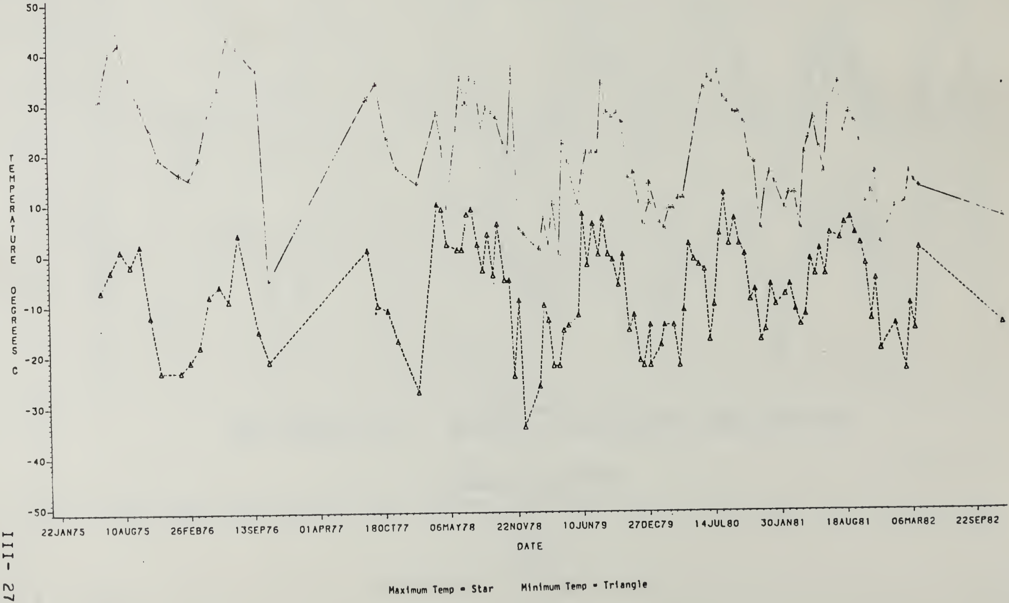


FIGURE 3.1-3 (Contd)

TIME SERIES PLOT — MAXIMUM AND MINIMUM TEMPERATURE

STATION=BC02

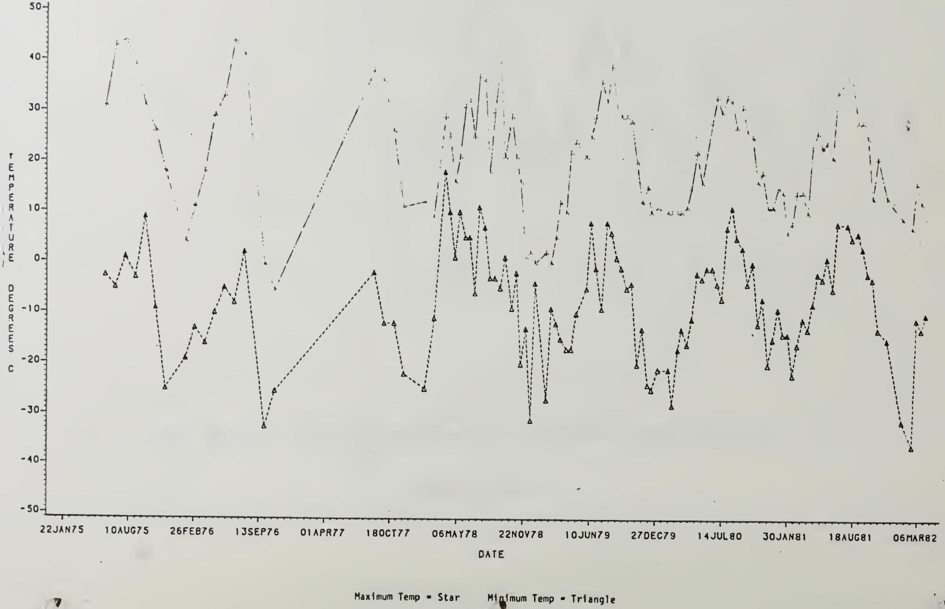


FIGURE 3.1-3 (Contd)

TIME SERIES PLOT – MAXIMUM AND MINIMUM TEMPERATURE
STATION=BC03

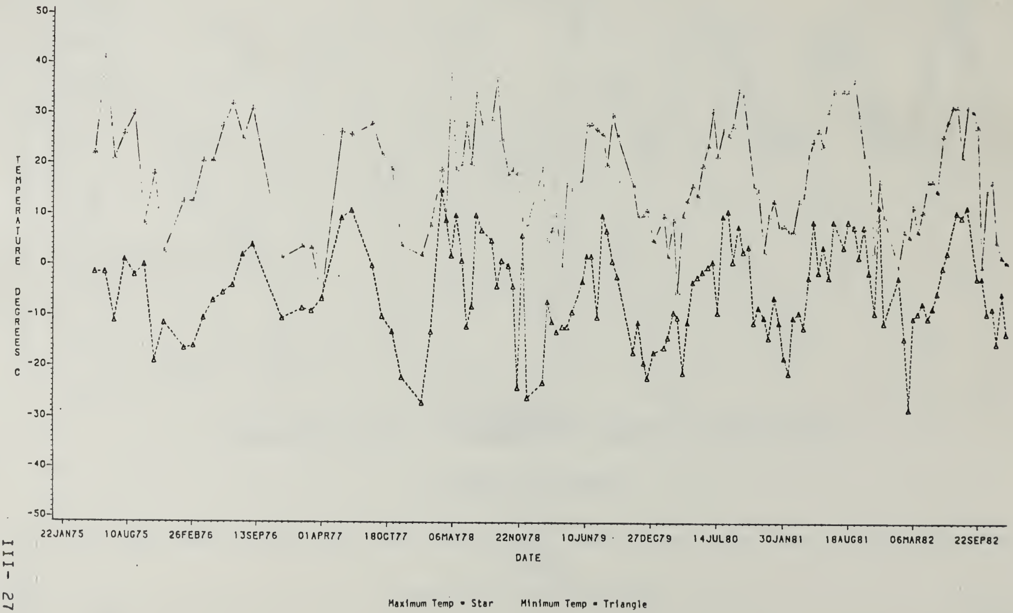


FIGURE 3.1-3 (Contd)

TIME SERIES PLOT – MAXIMUM AND MINIMUM TEMPERATURE
STATION=BC04

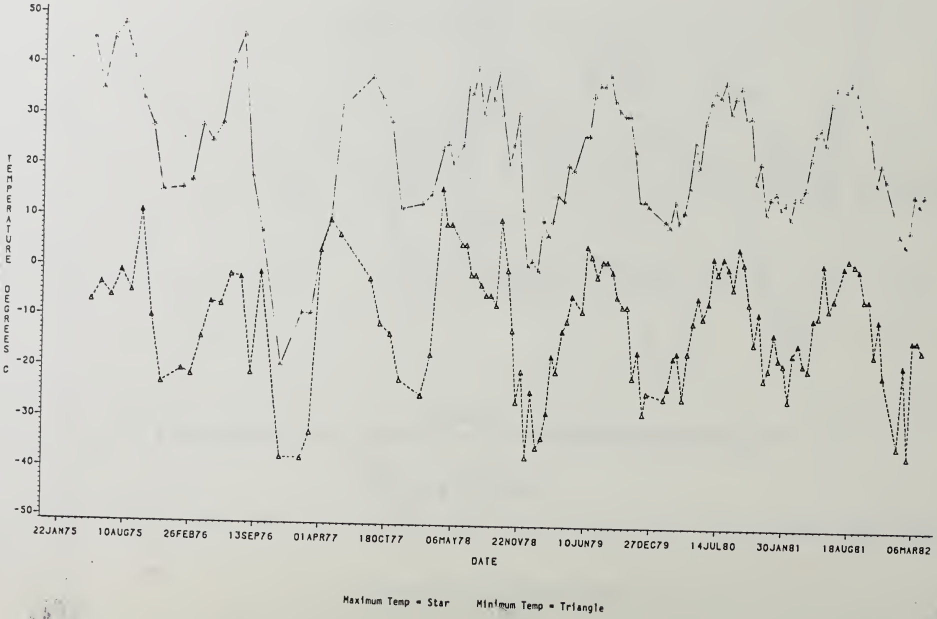


FIGURE 3.1-3 (Contd)

TIME SERIES PLOT – MAXIMUM AND MINIMUM TEMPERATURE
STATION=BCOS

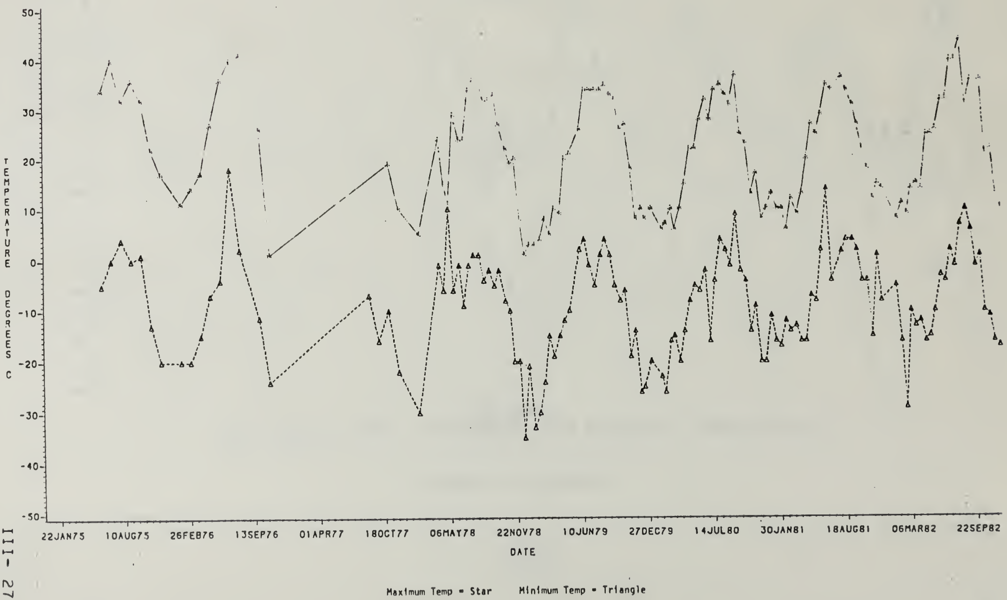


FIGURE 3.1-3 (Contd)

TIME SERIES PLOT – MAXIMUM AND MINIMUM TEMPERATURE
STATION=BC06

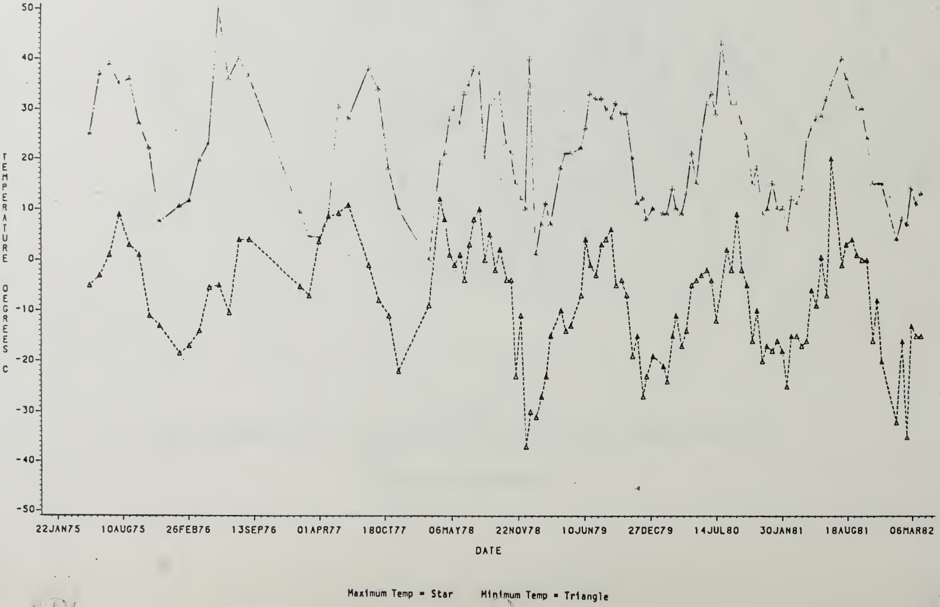


FIGURE 3.1-3 (Contd)

TIME SERIES PLOT – MAXIMUM AND MINIMUM TEMPERATURE
STATION=BC07

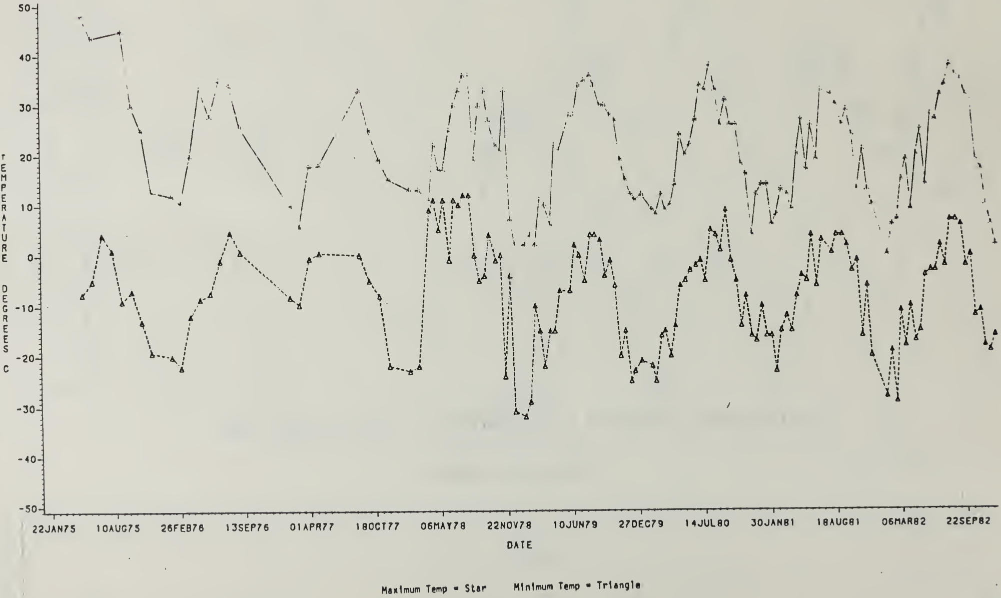
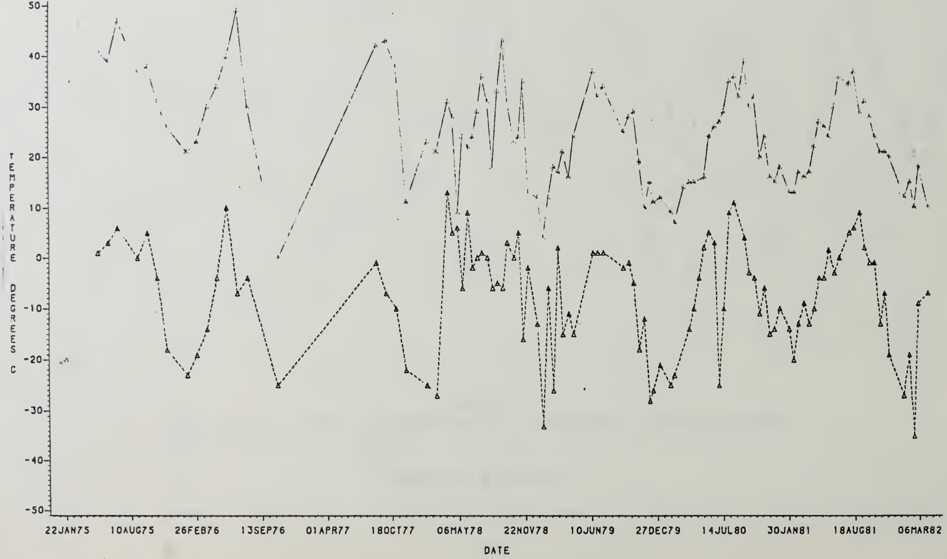


FIGURE 3.1-3 (Contd)

TIME SERIES PLOT – MAXIMUM AND MINIMUM TEMPERATURE
STATION=BC08



Maximum Temp = Star Mi[illegible] Temp = Triangle

FIGURE 3.1-3 (Contd)

TIME SERIES PLOT – MAXIMUM AND MINIMUM TEMPERATURE
STATION-BC09

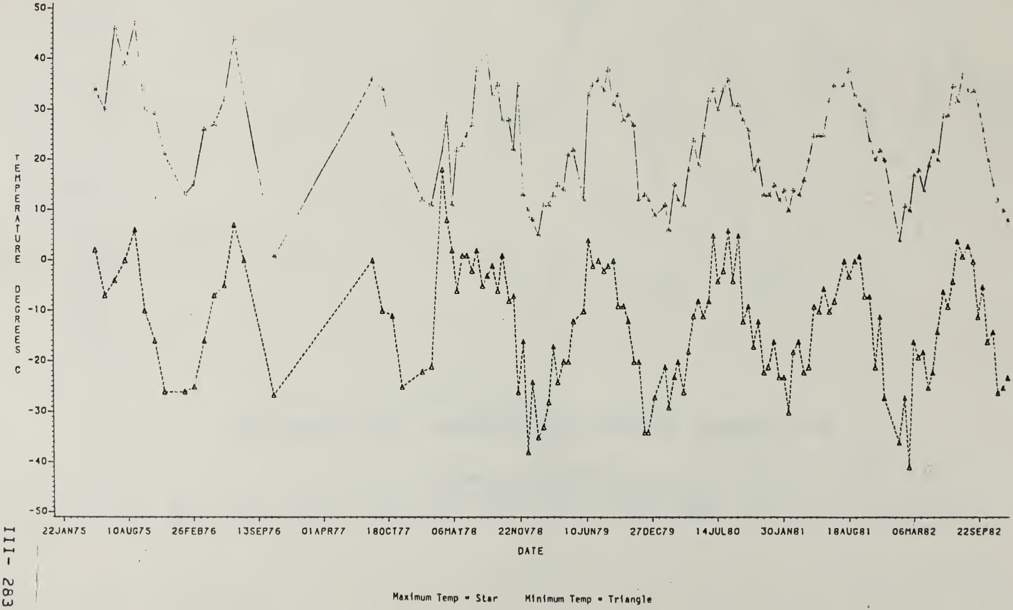
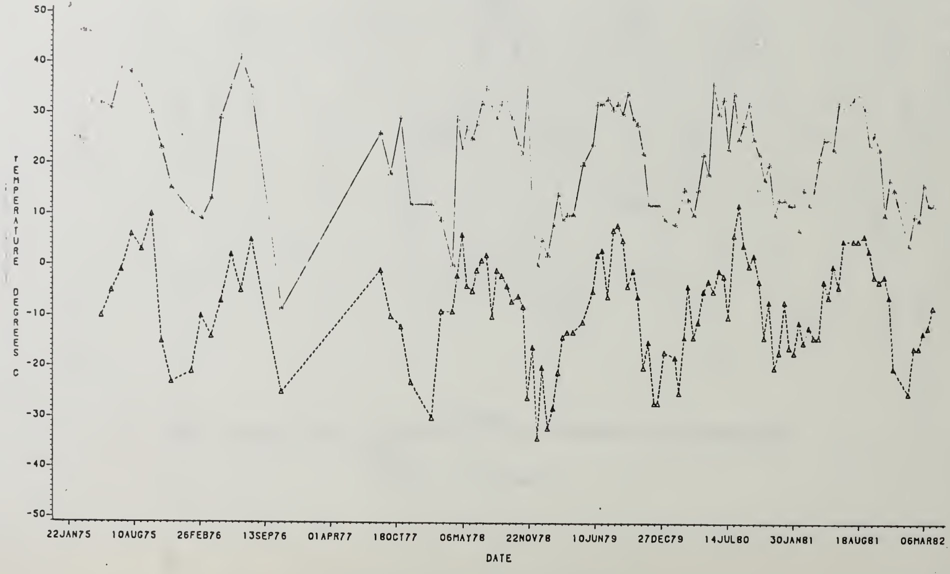


FIGURE 3.1-3 (Contd)

TIME SERIES PLOT — MAXIMUM AND MINIMUM TEMPERATURE

STATION=BC13



Maximum Temp = Star   Minimum Temp = Triangle

FIGURE 3.1-4 (Contd)

TIME SERIES PLOT – PRECIPITATION
STATION=BC02

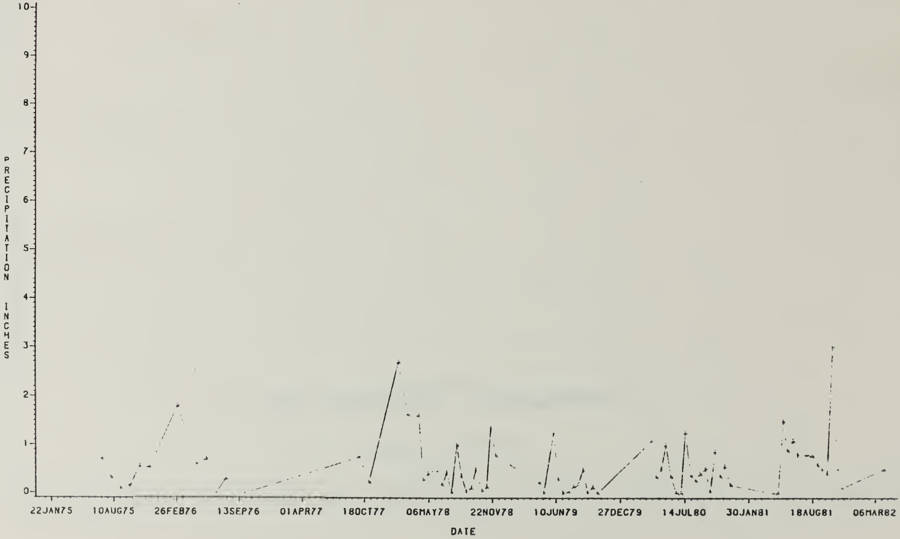


FIGURE 3.1-4 (Contd)

TIME SERIES PLOT – PRECIPITATION
STATION=BC02

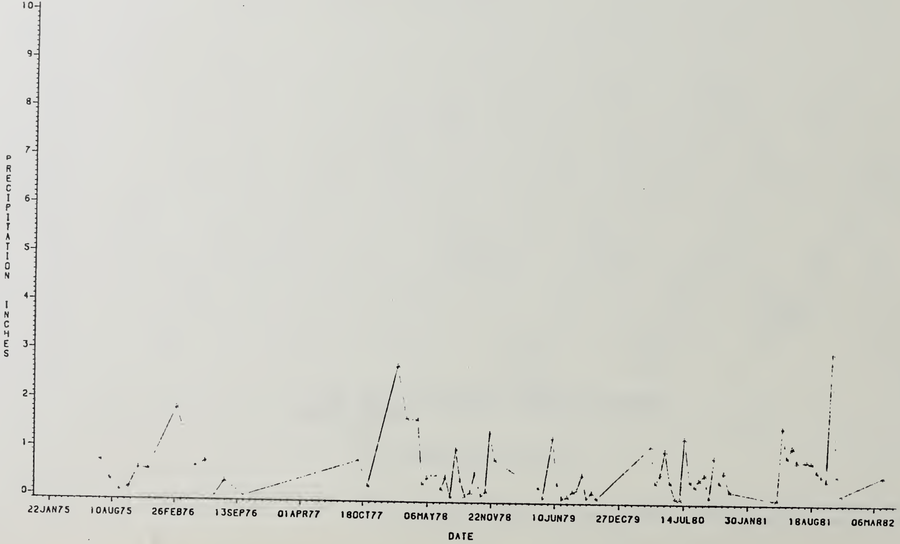


FIGURE 3.1-4 (Contd)

TIME SERIES PLOT – PRECIPITATION
STATION=BC03

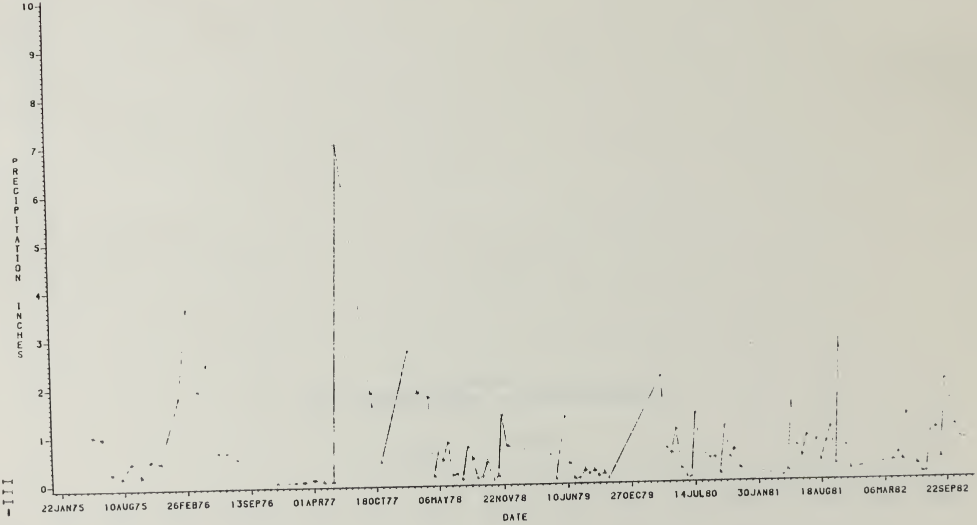


FIGURE 3.1-4 (Contd)

TIME SERIES PLOT – PRECIPITATION
STATION=BC04

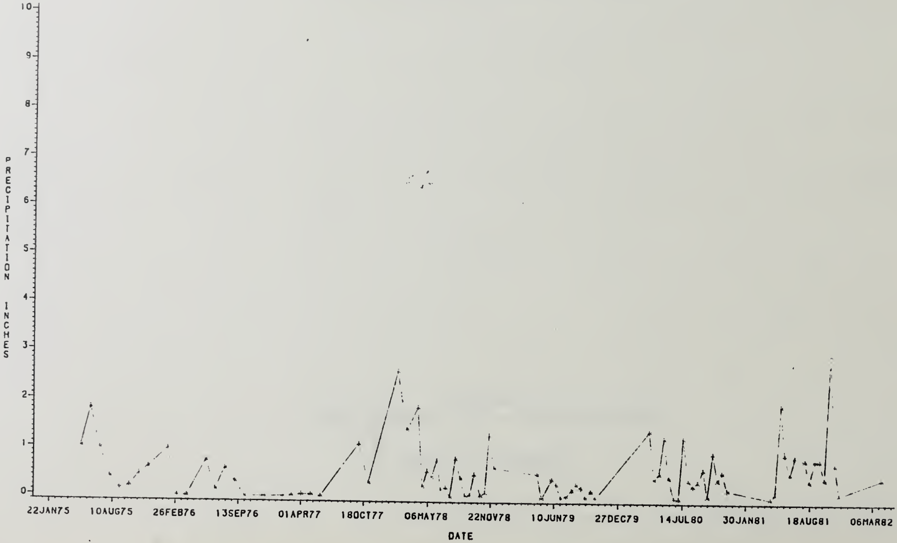


FIGURE 3.1-4 (Contd)

TIME SERIES PLOT – PRECIPITATION
STATION=BCOS

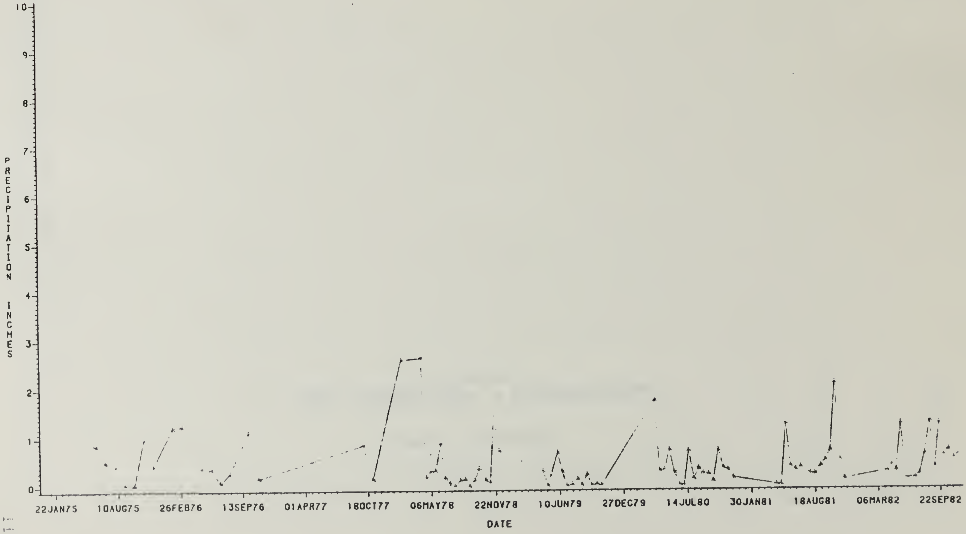


FIGURE 3.1-4 (Contd)

TIME SERIES PLOT – PRECIPITATION
STATION=BC06

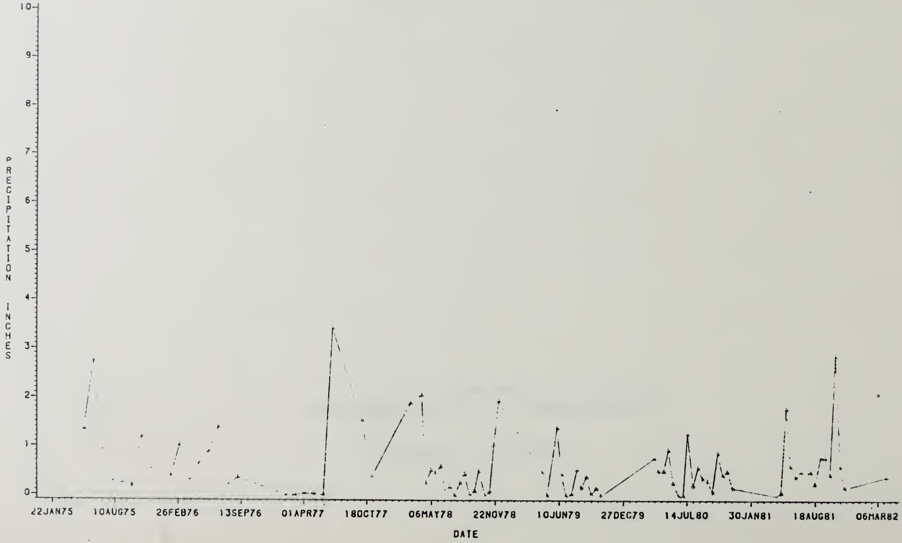


FIGURE 3.1-4 (Contd)

TIME SERIES PLOT – PRECIPITATION
STATION=BC07

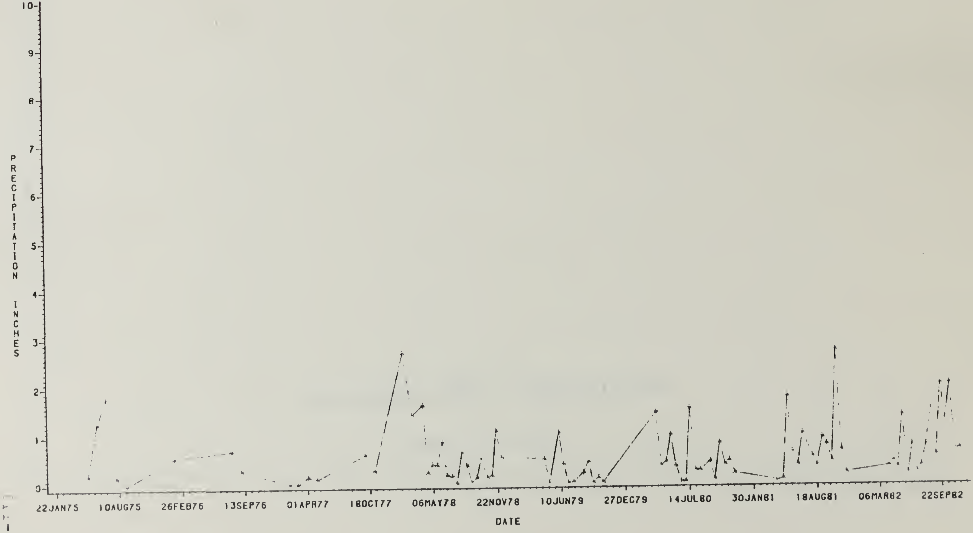


FIGURE 3.1-4 (Contd)

TIME SERIES PLOT – PRECIPITATION
STATION-BC08

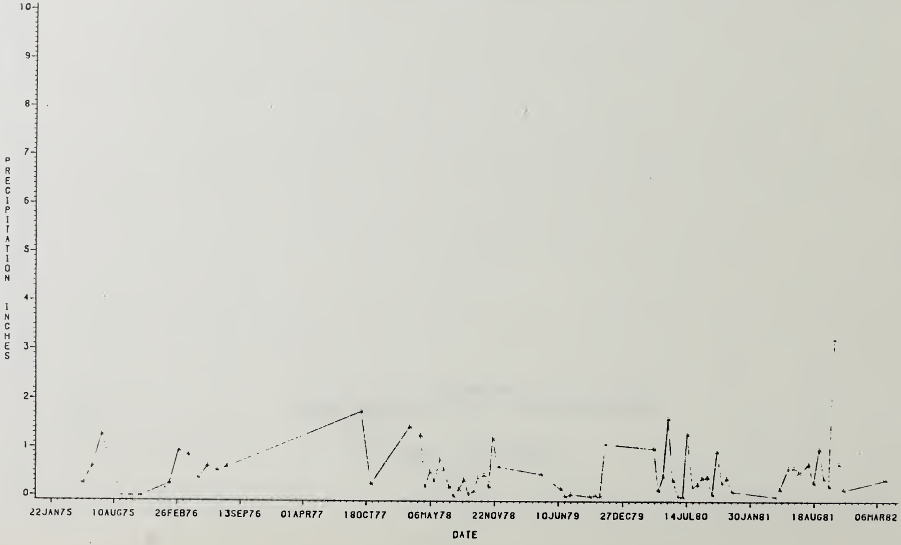


FIGURE 3.1-4 (Contd)

TIME SERIES PLOT – PRECIPITATION
STATION=BC09

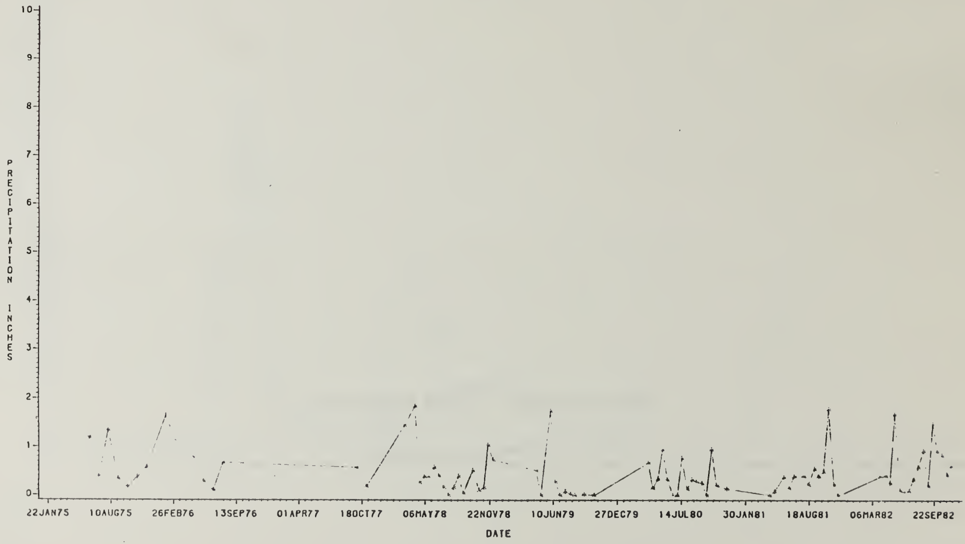


FIGURE 3.1-4 (Contd)

TIME SERIES PLOT – PRECIPITATION
STATION=BC13

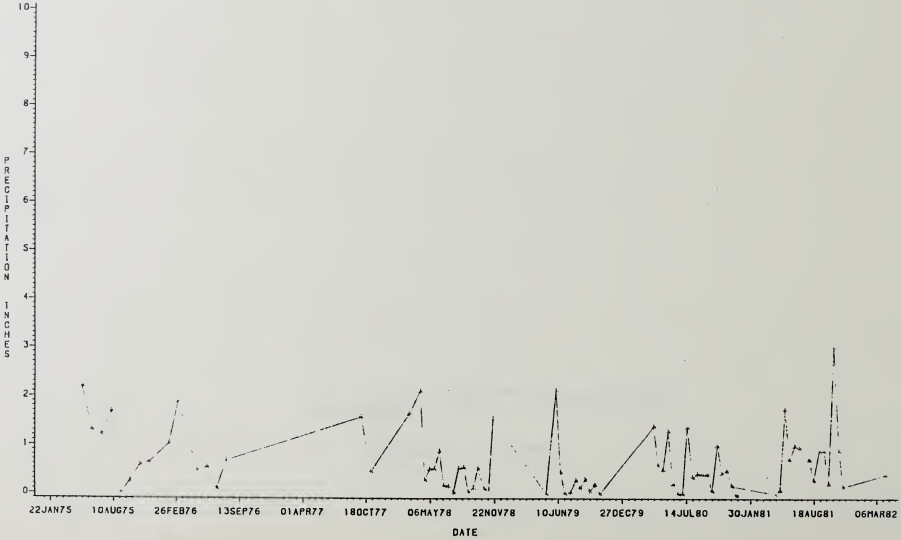


FIGURE 3.1-5

TIME SERIES PLOT – SNOW DEPTH
STATION=BC01

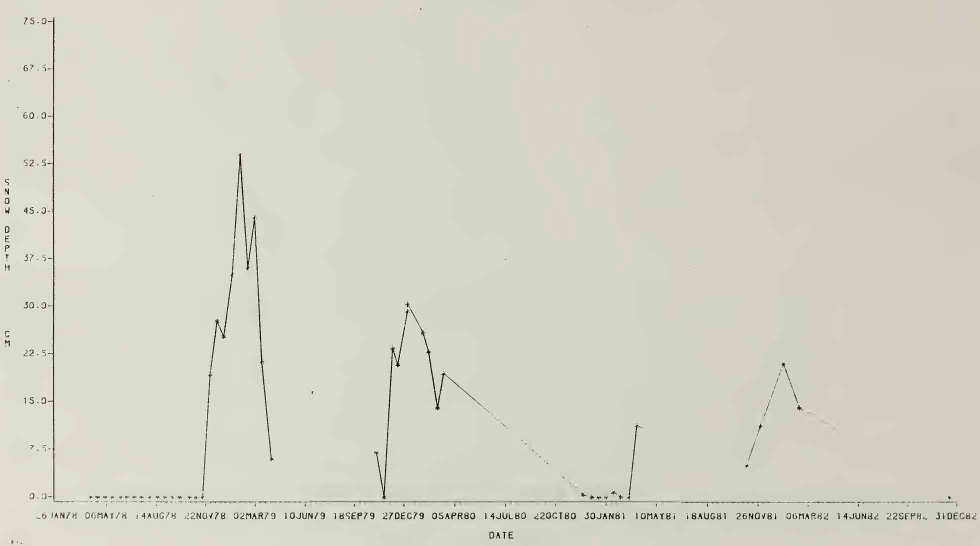


FIGURE 3.1-5 (Contd)

TIME SERIES PLOT – SNOW DEPTH
STATION=BC02

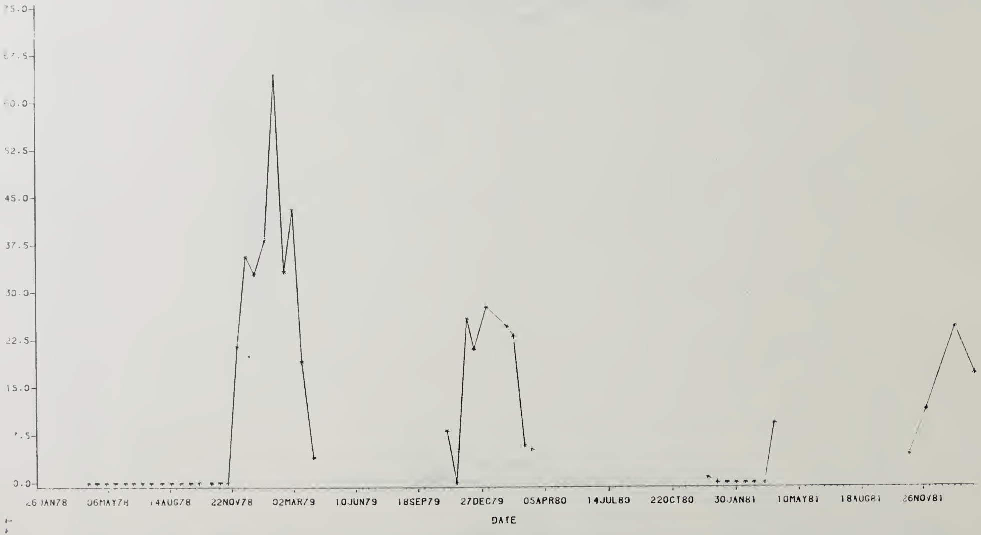


FIGURE 3.1-5 (Contd)

TIME SERIES PLOT – SNOW DEPTH

STATION=BC03

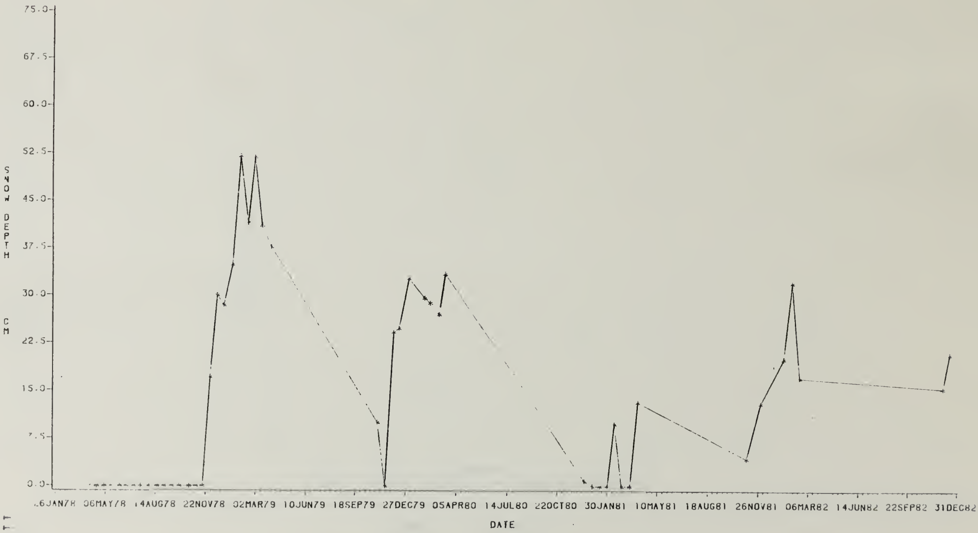


FIGURE 3.1-5 (Contd)

TIME SERIES PLOT – SNOW DEPTH
STATION=BC04

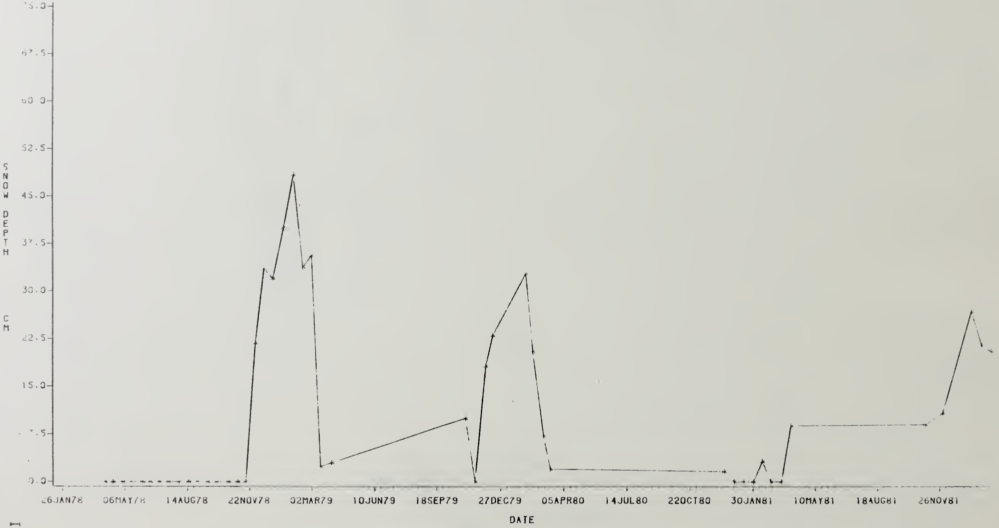


FIGURE 3.1-5 (Contd)

TIME SERIES PLOT – SNOW DEPTH
STATION=BC05

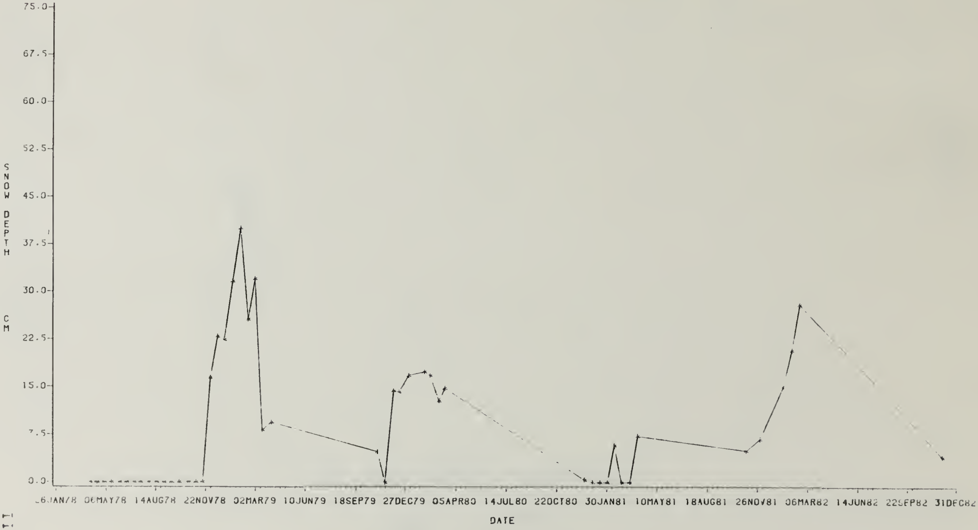


FIGURE 3.1-5 (Contd)

TIME SERIES PLOT – SNOW DEPTH

STATION=BC06

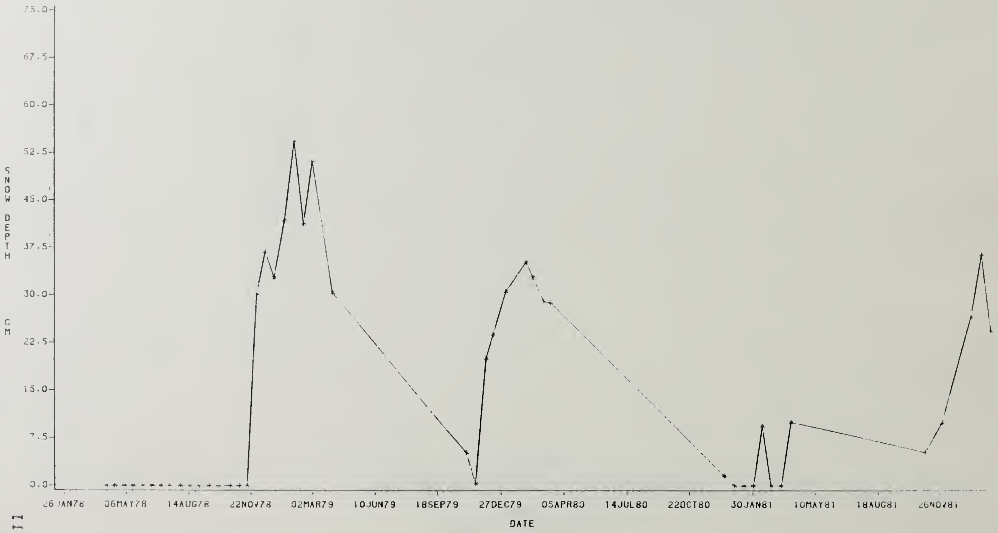


FIGURE 3.1-5 (Contd)

TIME SERIES PLOT – SNOW DEPTH

STATION=BC07

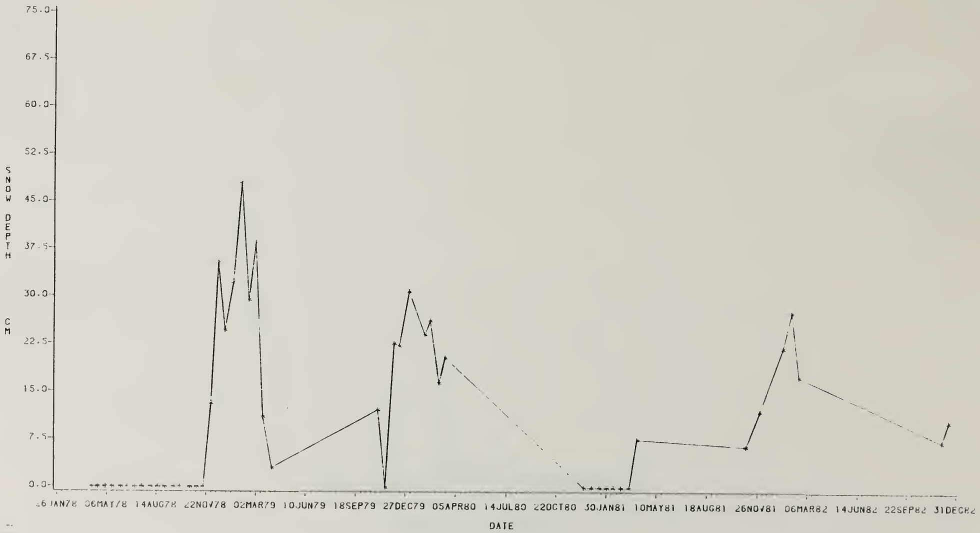


FIGURE 3.1-5 (Contd)

TIME SERIES PLOT — SNOW DEPTH
STATION=BC08

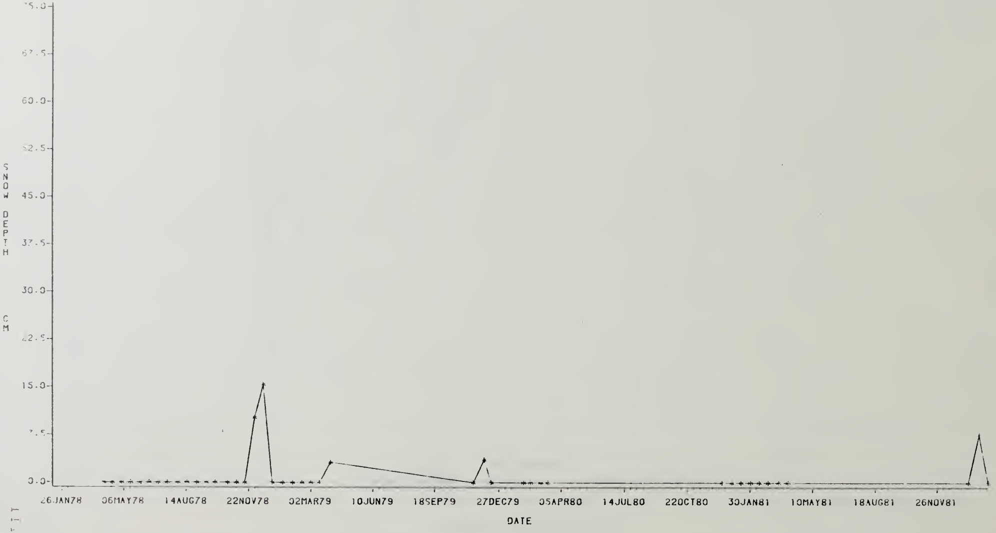
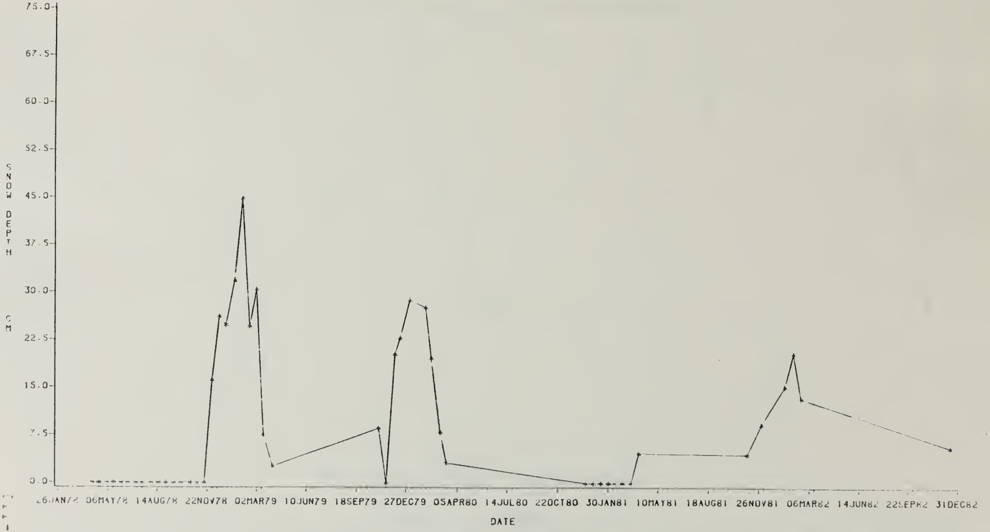


FIGURE 3.1-5 (Contd)



TIME SERIES PLOT – SNOW DEPTH

STATION=BC09

FIGURE 3.1-5 (Contd)

TIME SERIES PLOT – SNOW DEPTH

STATION=BC13

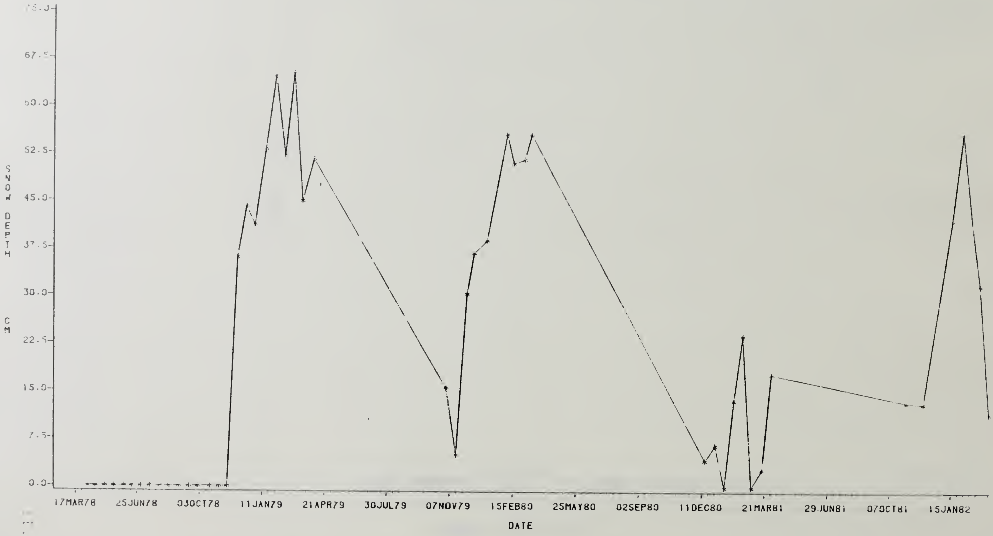


FIGURE 3.1-6

TIME SERIES PLOT – SNOW MOISTURE
STATION=BC01

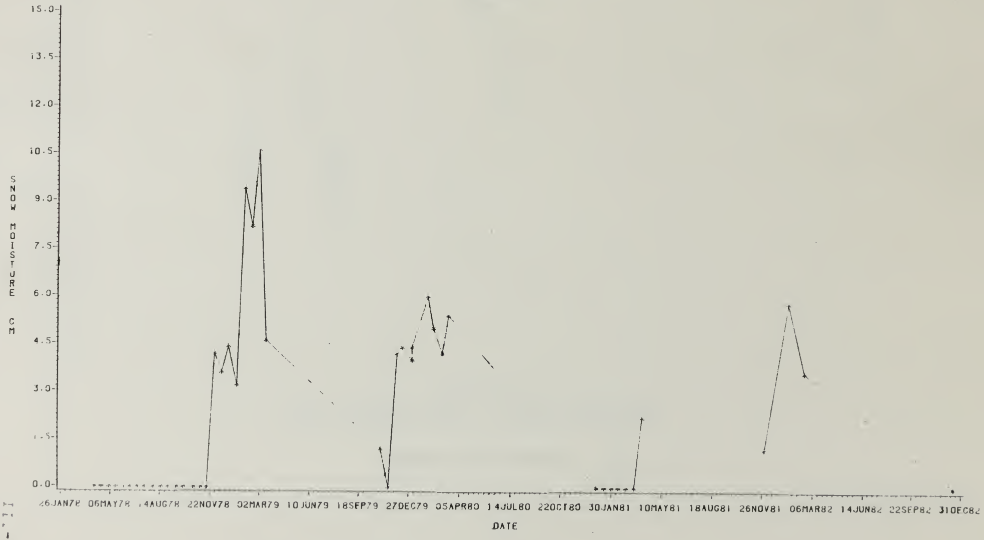


FIGURE 3.1-6 (Contd)

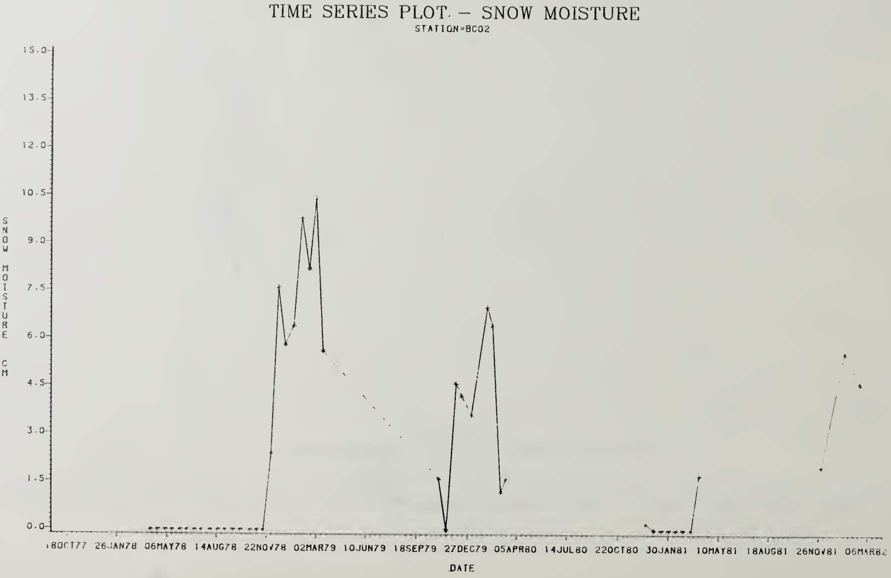


FIGURE 3.1-6 (Contd)

TIME SERIES PLOT – SNOW MOISTURE
STATION=BC03

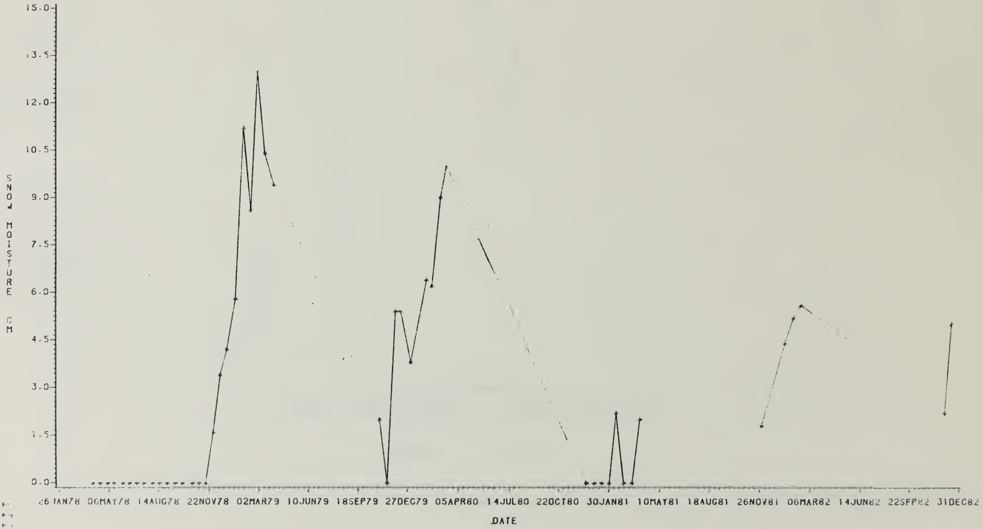


FIGURE 3.1-6 (Contd)

TIME SERIES PLOT – SNOW MOISTURE
STATION=BC04

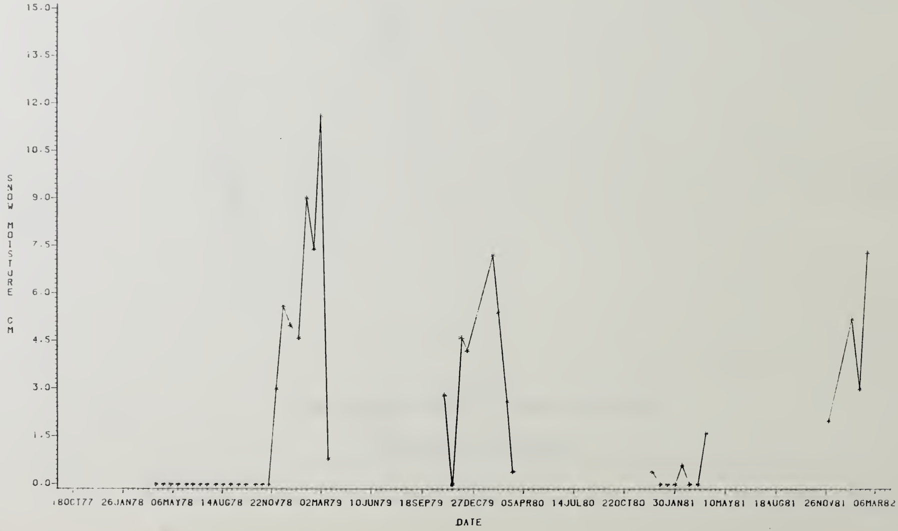


FIGURE 3.1-6 (Contd)

TIME SERIES PLOT - SNOW MOISTURE
STATION=BC05

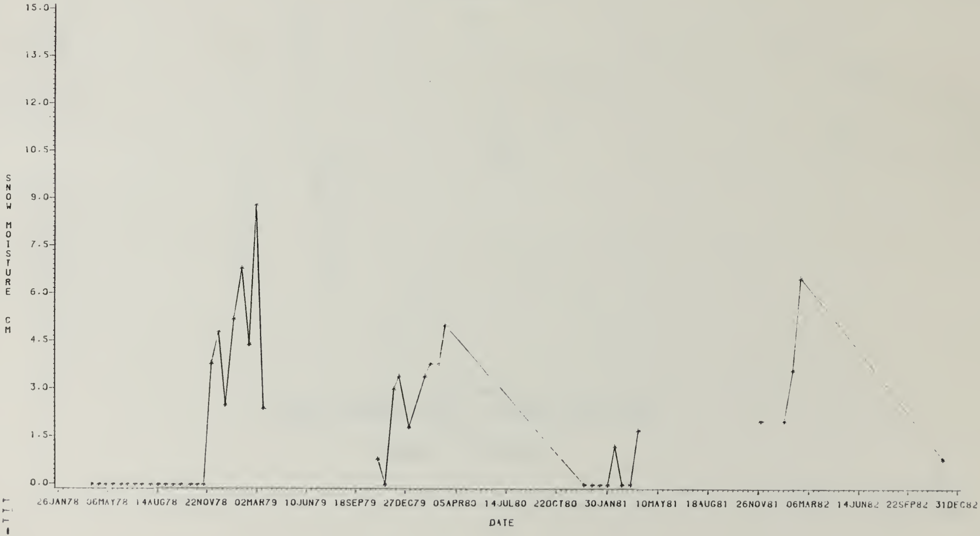


FIGURE 3.1-6 (Contd)

TIME SERIES PLOT - SNOW MOISTURE

STATION=BC06

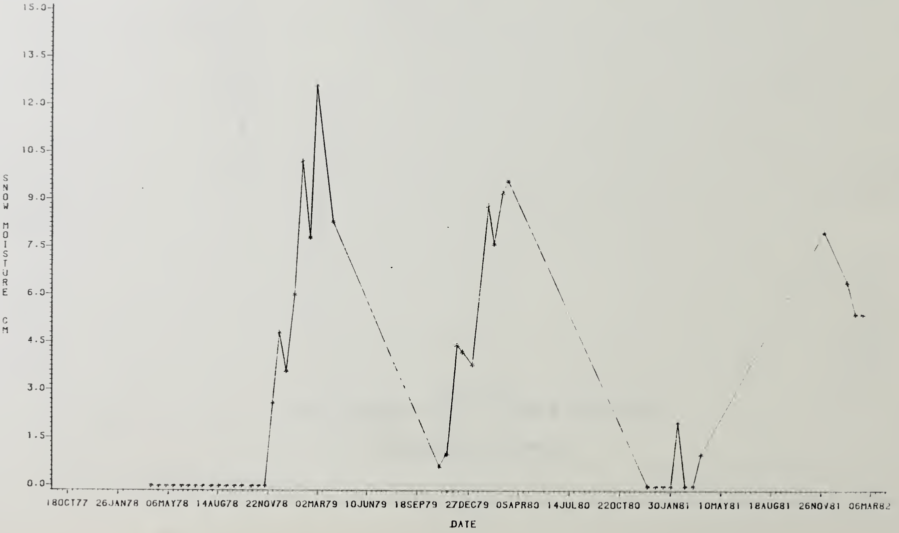


FIGURE 3.1-6 (Contd)

TIME SERIES PLOT – SNOW MOISTURE

STATION=BC07

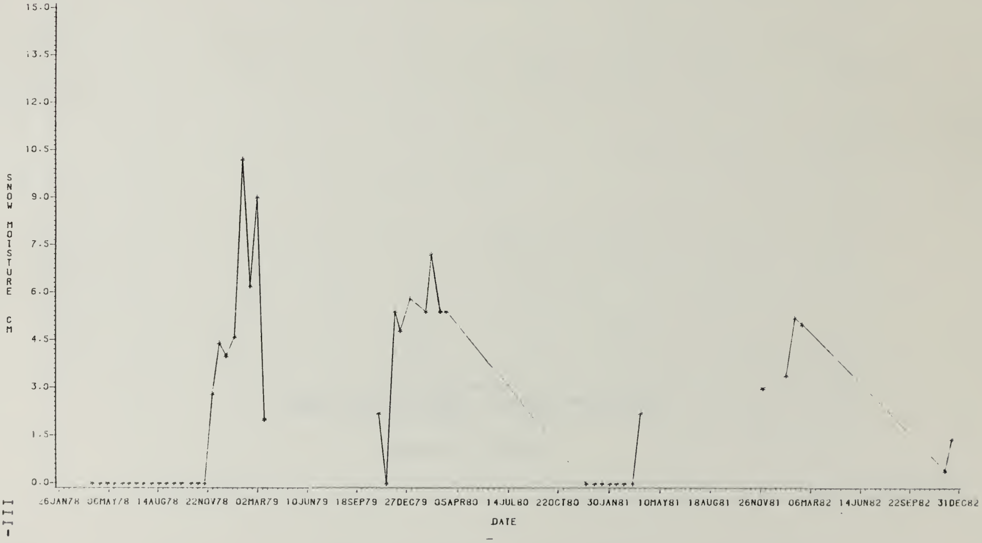


FIGURE 3.1-6 (Contd)

TIME SERIES PLOT — SNOW MOISTURE
STATION=BC08

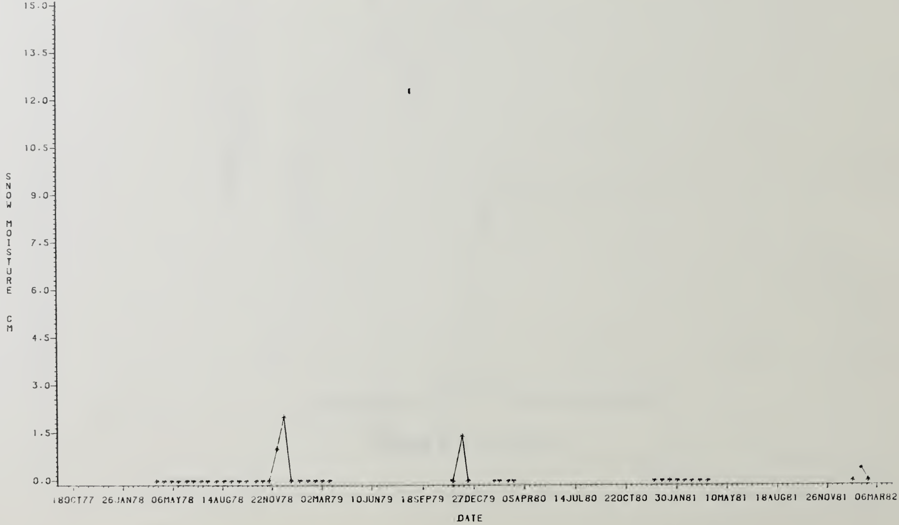


FIGURE 3.1-6 (Contd)

TIME SERIES PLOT – SNOW MOISTURE
STATION=BC09

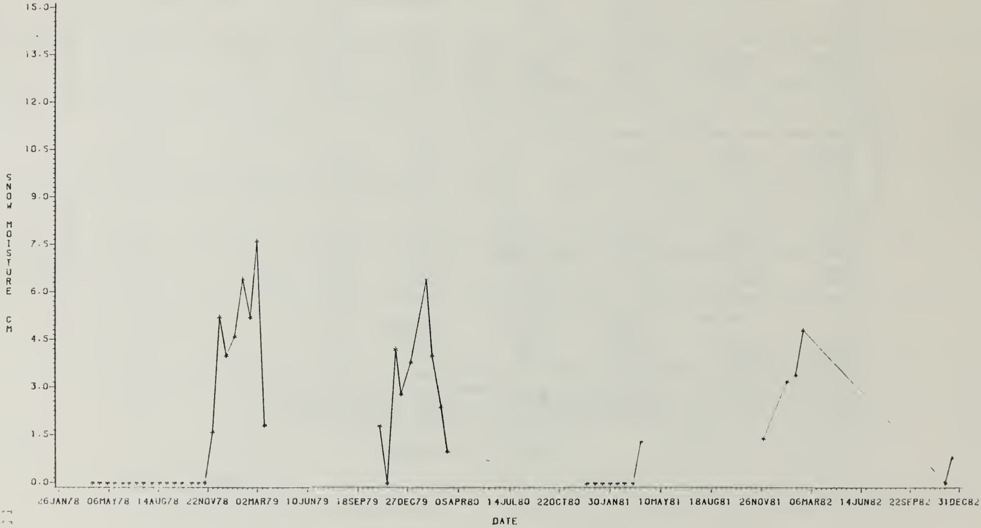


FIGURE 3.1-6 (Contd)

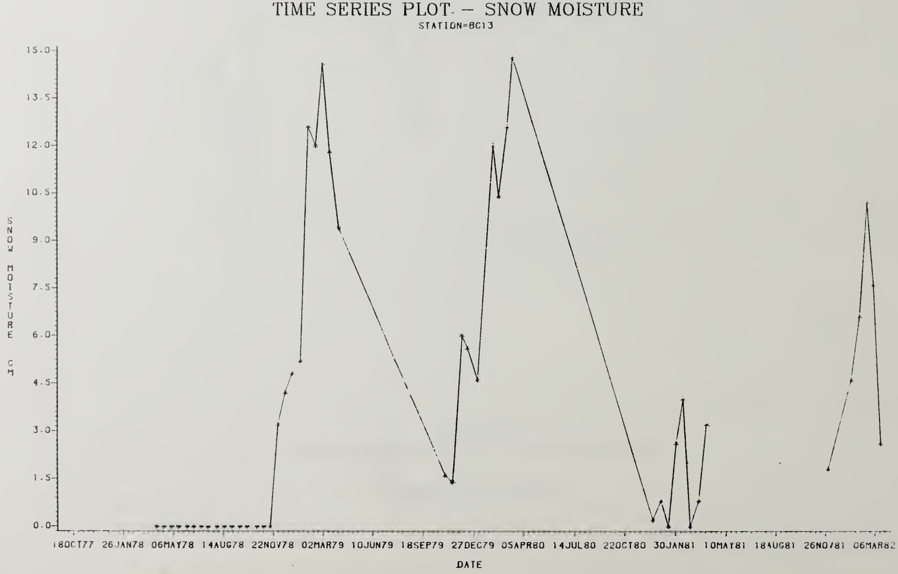


TABLE 3.1-7

MONTHLY SNOW DEPTH AND SNOW MOISTURE STATISTICS

VARIABLE *	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	VARIANCE	C.V.
STATION=BC01		YEAR=78	MONTH=12				
SND	3	24.00	4.33	19.20	27.60	18.72	18.03
SNM	3	4.07	0.42	3.60	4.40	0.17	10.24
STATION=BC01		YEAR=79	MONTH=1				
SND	2	44.50	13.44	35.00	54.00	180.50	30.19
SNM	2	6.30	4.38	3.20	9.40	19.22	69.59
STATION=BC01		YEAR=79	MONTH=2				
SND	1	36.00	.	36.00	36.00	.	.
SNM	1	8.20	.	8.20	8.20	.	.
STATION=BC01		YEAR=79	MONTH=3				
SND	2	32.60	16.12	21.20	44.00	259.92	49.45
SNM	2	7.60	4.24	4.60	10.60	18.00	55.82
STATION=BC01		YEAR=79	MONTH=4				
SND	1	6.00	.	6.00	6.00	.	.
SNM	0	.	.	.	.	.	.
STATION=BC01		YEAR=79	MONTH=11				
SND	2	3.50	4.95	0	7.00	24.50	141.42
SNM	2	0.60	0.85	0	1.20	0.72	141.42
STATION=BC01		YEAR=79	MONTH=12				
SND	2	22.10	1.84	20.80	23.40	3.38	8.32
SNM	2	4.30	0.14	4.20	4.40	0.02	3.29
STATION=BC01		YEAR=80	MONTH=1				
SND	2	29.80	0.85	29.20	30.40	0.72	2.85
SNM	2	4.20	0.28	4.00	4.40	0.08	6.73
STATION=BC01		YEAR=80	MONTH=2				
VARIABLE	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	VARIANCE	C.V.
SND	2	24.30	2.12	22.80	25.80	4.50	8.73
SNM	2	5.50	0.71	5.00	6.00	0.50	12.86
STATION=BC01		YEAR=80	MONTH=3				
SND	2	16.70	3.82	14.00	19.40	14.58	22.86
SNM	2	4.80	0.85	4.20	5.40	0.72	17.68

*

SND = Snow Depth (cm)
SNM = Snow Moisture (cm)

Metric Conversion Factor = 2.54cm = 1.0in.

```
                         MONTHLY SNOW DEPTH AND SNOW MOISTURE STATISTICS
---------------------------------- STATION=BC01   YEAR=80   MONTH=12 ----------------------------------

VARIABLE *     N        MEAN       STANDARD        MINIMUM        MAXIMUM        VARIANCE        C.V.
                                   DEVIATION       VALUE          VALUE

SND            2        0.20       0.28            0              0.40           0.08          141.42
SNM            1        0.00       .               0              0.00           .             .

---------------------------------- STATION=BC01   YEAR=81   MONTH=1 -----------------------------------

SND            2        0          0               0              0              0             .
SNM            2        0          0               0              0              0             .

---------------------------------- STATION=BC01   YEAR=81   MONTH=2 -----------------------------------

SND            2        0.40       0.57            0              0.80           0.32          141.42
SNM            2        0.00       0.00            0              0.00           0.00          .

---------------------------------- STATION=BC01   YEAR=81   MONTH=3 -----------------------------------

SND            2        5.60       7.92            0              11.20          62.72         141.42
SNM            2        1.10       1.56            0              2.20           2.42          141.42

---------------------------------- STATION=BC01   YEAR=81   MONTH=11 ----------------------------------

SND            2        8.10       4.38            5.00           11.20          19.22         54.12
SNM            1        1.20       .               1.20           1.20           .             .

---------------------------------- STATION=BC01   YEAR=82   MONTH=1 -----------------------------------

SND            1        21.00      .               21.00          21.00          .             .
SNM            1        5.80       .               5.80           5.80           .             .

---------------------------------- STATION=BC01   YEAR=82   MONTH=2 -----------------------------------

SND            1        14.00      .               14.00          14.00          .             .
SNM            1        3.60       .               3.60           3.60           .             .
```

*

SND = Snow Depth (cm)
SNM = Snow Moisture (cm)

Metric Conversion Factor = 2.54cm = 1.0in.

MONTHLY SNOW DEPTH AND SNOW MOISTURE STATISTICS

VARIABLE *	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	VARIANCE	C.V.
			STATION=BC02	YEAR=78	MONTH=12		
SND	3	29.93	7.52	21.40	35.60	56.57	25.13
SNM	3	5.27	2.64	2.40	7.60	6.97	50.14
			STATION=BC02	YEAR=79	MONTH=1		
SND	2	51.30	18.53	38.20	64.40	343.22	36.11
SNM	2	8.10	2.40	6.40	9.80	5.78	29.68
			STATION=BC02	YEAR=79	MONTH=2		
SND	1	33.20	.	33.20	33.20	.	.
SNM	1	8.20	.	8.20	8.20	.	.
			STATION=BC02	YEAR=79	MONTH=3		
SND	2	31.00	16.97	19.00	43.00	288.00	54.74
SNM	2	8.00	3.39	5.60	10.40	11.52	42.43
			STATION=BC02	YEAR=79	MONTH=4		
SND	1	4.00	.	4.00	4.00	.	.
SNM	0	.	.	.	.	.	.
			STATION=BC02	YEAR=79	MONTH=11		
SND	2	4.10	5.80	0	8.20	33.62	141.42
SNM	2	0.80	1.13	0	1.60	1.28	141.42
			STATION=BC02	YEAR=79	MONTH=12		
SND	2	23.40	3.39	21.00	25.80	11.52	14.50
SNM	2	4.40	0.28	4.20	4.60	0.08	6.43
			STATION=BC02	YEAR=80	MONTH=1		
SND	1	27.60	.	27.60	27.60	.	.
SNM	1	3.60	.	3.60	3.60	.	.
			STATION=BC02	YEAR=80	MONTH=2		
SND	2	23.80	1.13	23.00	24.60	1.28	4.75
SNM	2	6.70	0.42	6.40	7.00	0.18	6.33
			STATION=BC02	YEAR=80	MONTH=3		
SND	2	5.50	0.42	5.20	5.80	0.18	7.71
SNM	2	1.40	0.28	1.20	1.60	0.08	20.20

*

SND = Snow Depth (cm)
SNM = Snow Moisture (cm)

Metric Conversion Factor = 2.54cm = 1.0in.

MONTHLY SNOW DEPTH AND SNOW MOISTURE STATISTICS
STATION=BC02 YEAR=82 MONTH=2

VARIABLE *	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	VARIANCE	C.V.
STATION=BC02 YEAR=80 MONTH=12							
SND	2	0.40	0.57	0	0.80	0.32	141.42
SNM	2	0.10	0.14	0	0.20	0.02	141.42
STATION=BC02 YEAR=81 MONTH=1							
SND	2	0	0	0	0	0	.
SNM	2	0	0	0	0	0	.
STATION=BC02 YEAR=81 MONTH=2							
SND	2	0	0	0	0	0	.
SNM	2	0	0	0	0	0	.
STATION=BC02 YEAR=81 MONTH=3							
SND	2	4.65	6.58	0	9.30	43.24	141.42
SNM	2	0.85	1.20	0	1.70	1.44	141.42
STATION=BC02 YEAR=81 MONTH=11							
SND	2	7.85	5.02	4.30	11.40	25.21	63.95
SNM	1	2.00	.	2.00	2.00	.	.
STATION=BC02 YEAR=82 MONTH=1							
SND	1	24.40	.	24.40	24.40	.	.
SNM	1	5.60	.	5.60	5.60	.	.
STATION=BC02 YEAR=82 MONTH=2							
SND	1	17.00	.	17.00	17.00	.	.
SNM	1	4.60	.	4.60	4.60	.	.

*

SND = Snow Depth (cm)
SNM = Snow Moisture (cm)

Metric Conversion Factor = 2.54cm = 1.0in.

MONTHLY SNOW DEPTH AND SNOW MOISTURE STATISTICS

VARIABLE *	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	VARIANCE	C.V.
			STATION=BC03	YEAR=78	MONTH=12		
SND SNM	3 3	25.17 3.07	7.03 1.33	17.10 1.60	30.00 4.20	49.44 1.77	27.94 43.42
			STATION=BC03	YEAR=79	MONTH=1		
SND SNM	2 2	43.40 8.50	12.16 3.82	34.80 5.80	52.00 11.20	147.92 14.58	28.02 44.92
			STATION=BC03	YEAR=79	MONTH=2		
SND SNM	1 1	41.40 8.60	. .	41.40 8.60	41.40 8.60	. .	. .
			STATION=BC03	YEAR=79	MONTH=3		
SND SNM	2 2	46.40 11.70	7.64 1.84	41.00 10.40	51.80 13.00	58.32 3.38	16.46 15.71
			STATION=BC03	YEAR=79	MONTH=4		
SND SNM	1 1	37.60 9.40	. .	37.60 9.40	37.60 9.40	. .	. .
			STATION=BC03	YEAR=79	MONTH=11		
SND SNM	2 2	5.00 1.00	7.07 1.41	0 0	10.00 2.00	50.00 2.00	141.42 141.42
			STATION=BC03	YEAR=79	MONTH=12		
SND SNM	2 2	24.50 5.40	0.42 0.00	24.20 5.40	24.80 5.40	0.18 0.00	1.73 0.00
			STATION=BC03	YEAR=80	MONTH=1		
SND SNM	1 1	32.70 3.80	. .	32.70 3.80	32.70 3.80	. .	. .
			STATION=BC03	YEAR=80	MONTH=2		
SND SNM	2 2	29.20 6.30	0.57 0.14	28.80 6.20	29.60 6.40	0.32 0.02	1.94 2.24
			STATION=BC03	YEAR=80	MONTH=3		
SND SNM	2 2	30.20 9.50	4.53 0.71	27.00 9.00	33.40 10.00	20.48 0.50	14.99 7.44

*

SND = Snow Depth (cm)
SNM = Snow Moisture (cm)

Metric Conversion Factor = 2.54cm = 1.0in.

MONTHLY SNOW DEPTH AND SNOW MOISTURE STATISTICS

VARIABLE *	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	VARIANCE	C.V.
			STATION=BC03	YEAR=80	MONTH=12		
SND	2	0.40	0.57	0	0.80	0.32	141.42
SNM	2	0.00	0.00	0	0.00	0.00	.
			STATION=BC03	YEAR=81	MONTH=1		
SND	2	0	0	0	0	0	.
SNM	2	0	0	0	0	0	.
			STATION=BC03	YEAR=81	MONTH=2		
SND	2	4.90	6.93	0	9.80	48.02	141.42
SNM	2	1.10	1.56	0	2.20	2.42	141.42
			STATION=BC03	YEAR=81	MONTH=3		
SND	2	6.60	9.33	0	13.20	87.12	141.42
SNM	2	1.00	1.41	0	2.00	2.00	141.42
			STATION=BC03	YEAR=81	MONTH=11		
SND	2	8.65	6.15	4.30	13.00	37.85	71.12
SNM	1	1.80	.	1.80	1.80	.	.
			STATION=BC03	YEAR=82	MONTH=1		
SND	1	20.00	.	20.00	20.00	.	.
SNM	1	4.40	.	4.40	4.40	.	.
			STATION=BC03	YEAR=82	MONTH=2		
SND	2	24.50	10.61	17.00	32.00	112.50	43.29
SNM	2	5.40	0.28	5.20	5.60	0.08	5.24

*

SND = Snow Depth (cm)
SNM = Snow Moisture (cm)

Metric Conversion Factor = 2.54cm = 1.0in.

MONTHLY SNOW DEPTH AND SNOW MOISTURE STATISTICS

VARIABLE*	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	VARIANCE	C.V.
STATION=BC04 YEAR=78 MONTH=12							
SND	3	29.10	6.37	21.80	33.50	40.53	21.88
SNM	3	4.53	1.36	3.00	5.60	1.85	30.03
STATION=BC04 YEAR=79 MONTH=1							
SND	2	44.20	5.94	40.00	48.40	35.28	13.44
SNM	2	6.80	3.11	4.60	9.00	9.68	45.75
STATION=BC04 YEAR=79 MONTH=2							
SND	1	33.80	.	33.80	33.80	.	.
SNM	1	7.40	.	7.40	7.40	.	.
STATION=BC04 YEAR=79 MONTH=3							
SND	2	19.00	23.48	2.40	35.60	551.12	123.56
SNM	2	6.20	7.64	0.80	11.60	58.32	123.17
STATION=BC04 YEAR=79 MONTH=4							
SND	1	3.00	.	3.00	3.00	.	.
SNM	0	.	.	.	.	.	.
STATION=BC04 YEAR=79 MONTH=11							
SND	2	5.00	7.07	0	10.00	50.00	141.42
SNM	2	1.40	1.98	0	2.80	3.92	141.42
STATION=BC04 YEAR=79 MONTH=12							
SND	2	20.60	3.39	18.20	23.00	11.52	16.48
SNM	2	4.40	0.28	4.20	4.60	0.08	6.43
STATION=BC04 YEAR=80 MONTH=2							
SND	2	26.60	8.77	20.40	32.80	76.88	32.96
SNM	2	6.30	1.27	5.40	7.20	1.62	20.20
STATION=BC04 YEAR=80 MONTH=3							
SND	2	4.60	3.68	2.00	7.20	13.52	79.93
SNM	2	1.50	1.56	0.40	2.60	2.42	103.71

*

SND = Snow Depth (cm)
SNM = Snow Moisture (cm)

Metric Conversion Factor = 2.54cm = 1.0in.

MONTHLY SNOW DEPTH AND SNOW MOISTURE STATISTICS

VARIABLE *	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	VARIANCE	C.V.
STATION=BC04 YEAR=80 MONTH=12							
SND	2	0.80	1.13	0	1.60	1.28	141.42
SNM	2	0.20	0.28	0	0.40	0.08	141.42
STATION=BC04 YEAR=81 MONTH=1							
SND	2	0	0	0	0	0	.
SNM	2	0	0	0	0	0	.
STATION=BC04 YEAR=81 MONTH=2							
SND	2	1.60	2.26	0	3.20	5.12	141.42
SNM	2	0.30	0.42	0	0.60	0.18	141.42
STATION=BC04 YEAR=81 MONTH=3							
SND	2	4.40	6.22	0	8.80	38.72	141.42
SNM	2	0.80	1.13	0	1.60	1.28	141.42
STATION=BC04 YEAR=81 MONTH=11							
SND	2	9.90	1.27	9.00	10.80	1.62	12.86
SNM	1	2.00	.	2.00	2.00	.	.
STATION=BC04 YEAR=82 MONTH=1							
SND	1	26.80	.	26.80	26.80	.	.
SNM	1	5.20	.	5.20	5.20	.	.
STATION=BC04 YEAR=82 MONTH=2							
SND	2	20.95	0.64	20.50	21.40	0.40	3.04
SNM	2	5.15	3.04	3.00	7.30	9.24	59.04

*

SND = Snow Depth (cm)
SNM = Snow Moisture (cm)

Metric Conversion Factor = 2.54cm = 1.0in.

MONTHLY SNOW DEPTH AND SNOW MOISTURE STATISTICS

VARIABLE *	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	VARIANCE	C.V.
STATION=BC05 YEAR=78 MONTH=12							
SND	3	20.57	3.62	16.40	22.90	13.08	17.59
SNM	3	3.70	1.15	2.50	4.80	1.33	31.17
STATION=BC05 YEAR=79 MONTH=1							
SND	2	35.80	5.94	31.60	40.00	35.28	16.59
SNM	2	6.00	1.13	5.20	6.80	1.28	18.86
STATION=BC05 YEAR=79 MONTH=2							
SND	1	25.60	.	25.60	25.60	.	.
SNM	1	4.40	.	4.40	4.40	.	.
STATION=BC05 YEAR=79 MONTH=3							
SND	2	20.10	16.83	8.20	32.00	283.22	83.73
SNM	2	5.60	4.53	2.40	8.80	20.48	80.81
STATION=BC05 YEAR=79 MONTH=4							
SND	1	9.40	.	9.40	9.40	.	.
SNM	0	.	.	.	.	.	.
STATION=BC05 YEAR=79 MONTH=11							
SND	2	2.40	3.39	0	4.80	11.52	141.42
SNM	2	0.40	0.57	0	0.80	0.32	141.42
STATION=BC05 YEAR=79 MONTH=12							
SND	2	14.30	0.14	14.20	14.40	0.02	0.99
SNM	2	3.20	0.28	3.00	3.40	0.08	8.84
STATION=BC05 YEAR=80 MONTH=1							
SND	1	16.80	.	16.80	16.80	.	.
SNM	1	1.80	.	1.80	1.80	.	.
STATION=BC05 YEAR=80 MONTH=2							
SND	2	17.10	0.42	16.80	17.40	0.18	2.48
SNM	2	3.60	0.28	3.40	3.80	0.08	7.86
STATION=BC05 YEAR=80 MONTH=3							
SND	2	13.80	1.41	12.80	14.80	2.00	10.25
SNM	2	4.40	0.85	3.80	5.00	0.72	19.28

*

SND = Snow Depth (cm)
SNM = Snow Moisture (cm)

Metric Conversion Factor = 2.54cm = 1.0in.

MONTHLY SNOW DEPTH AND SNOW MOISTURE STATISTICS

VARIABLE *	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	VARIANCE	C.V.
STATION=BC05 YEAR=80 MONTH=12							
SND	2	0.20	0.28	0	0.40	0.08	141.42
SNM	2	0.00	0.00	0	0.00	0.00	.
STATION=BC05 YEAR=81 MONTH=1							
SND	2	0	0	0	0	0	.
SNM	2	0	0	0	0	0	.
STATION=BC05 YEAR=81 MONTH=2							
SND	2	2.90	4.10	0	5.80	16.82	141.42
SNM	2	0.60	0.85	0	1.20	0.72	141.42
STATION=BC05 YEAR=81 MONTH=3							
SND	2	3.65	5.16	0	7.30	26.64	141.42
SNM	2	0.85	1.20	0	1.70	1.44	141.42
STATION=BC05 YEAR=81 MONTH=11							
SND	2	5.90	1.27	5.00	6.80	1.62	21.57
SNM	1	2.00	.	2.00	2.00	.	.
STATION=BC05 YEAR=82 MONTH=1							
SND	1	15.20	.	15.20	15.20	.	.
SNM	1	2.00	.	2.00	2.00	.	.
STATION=BC05 YEAR=82 MONTH=2							
SND	2	24.40	5.09	20.80	28.00	25.92	20.87
SNM	2	5.05	2.05	3.60	6.50	4.21	40.61

*

SND = Snow Depth (cm)
SNM = Snow Moisture (cm)

Metric Conversion Factor = 2.54cm = 1.0in.

MONTHLY SNOW DEPTH AND SNOW MOISTURE STATISTICS

VARIABLE *	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	VARIANCE	C.V.
STATION=BC06 YEAR=78 MONTH=12							
SND	3	33.30	3.38	30.20	36.90	11.41	10.14
SNM	3	3.67	1.10	2.60	4.80	1.21	30.04
STATION=BC06 YEAR=79 MONTH=1							
SND	2	48.10	8.91	41.80	54.40	79.38	18.52
SNM	2	8.10	2.97	6.00	10.20	8.82	36.66
STATION=BC06 YEAR=79 MONTH=2							
SND	1	41.20	.	41.20	41.20	.	.
SNM	1	7.80	.	7.80	7.80	.	.
STATION=BC06 YEAR=79 MONTH=3							
SND	1	51.20	.	51.20	51.20	.	.
SNM	1	12.60	.	12.60	12.60	.	.
STATION=BC06 YEAR=79 MONTH=4							
SND	1	30.40	.	30.40	30.40	.	.
SNM	1	8.30	.	8.30	8.30	.	.
STATION=BC06 YEAR=79 MONTH=11							
SND	2	2.80	3.39	0.40	5.20	11.52	121.22
SNM	2	0.80	0.28	0.60	1.00	0.08	35.36
STATION=BC06 YEAR=79 MONTH=12							
SND	2	21.90	2.69	20.00	23.80	7.22	12.27
SNM	2	4.30	0.14	4.20	4.40	0.02	3.29
STATION=BC06 YEAR=80 MONTH=1							
SND	1	30.60	.	30.60	30.60	.	.
SNM	1	3.80	.	3.80	3.80	.	.
STATION=BC06 YEAR=80 MONTH=2							
SND	2	34.00	1.70	32.80	35.20	2.88	4.99
SNM	2	8.20	0.85	7.60	8.80	0.72	10.35
STATION=BC06 YEAR=80 MONTH=3							
SND	2	28.90	0.14	28.80	29.00	0.02	0.49
SNM	2	9.40	0.28	9.20	9.60	0.08	3.01

*

SND = Snow Depth (cm)
SNM = Snow Moisture (cm)

Metric Conversion Factor = 2.54cm = 1.0in.

MONTHLY SNOW DEPTH AND SNOW MOISTURE STATISTICS

VARIABLE *	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	VARIANCE	C.V.
STATION=BC06 YEAR=80 MONTH=12							
SND	2	0.80	1.13	0	1.60	1.28	141.42
SNM	2	0.00	0.00	0	0.00	0.00	.
STATION=BC06 YEAR=81 MONTH=1							
SND	2	0	0	0	0	0	.
SNM	2	0	0	0	0	0	.
STATION=BC06 YEAR=81 MONTH=2							
SND	2	4.70	6.65	0	9.40	44.18	141.42
SNM	2	1.00	1.41	0	2.00	2.00	141.42
STATION=BC06 YEAR=81 MONTH=3							
SND	2	5.00	7.07	0	10.00	50.00	141.42
SNM	2	0.50	0.71	0	1.00	0.50	141.42
STATION=BC06 YEAR=81 MONTH=11							
SND	2	7.63	3.36	5.25	10.00	11.28	44.05
SNM	1	8.00	.	8.00	8.00	.	.
STATION=BC06 YEAR=82 MONTH=1							
SND	1	26.60	.	26.60	26.60	.	.
SNM	1	6.40	.	6.40	6.40	.	.
STATION=BC06 YEAR=82 MONTH=2							
SND	2	30.40	8.49	24.40	36.40	72.00	27.91
SNM	2	5.40	0.00	5.40	5.40	0.00	0.00

*

SND = Snow Depth (cm)
SNM = Snow Moisture (cm)

Metric Conversion Factor = 2.54cm = 1.0 in.

MONTHLY SNOW DEPTH AND SNOW MOISTURE STATISTICS

VARIABLE *	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	VARIANCE	C.V.
STATION=BC07 YEAR=78 MONTH=12							
SND	3	24.30	11.05	13.10	35.20	122.17	45.49
SNM	3	3.73	0.83	2.80	4.40	0.69	22.30
STATION=BC07 YEAR=79 MONTH=1							
SND	2	40.10	11.17	32.20	48.00	124.82	27.86
SNM	2	7.40	3.96	4.60	10.20	15.68	53.51
STATION=BC07 YEAR=79 MONTH=2							
SND	1	29.40	.	29.40	29.40	.	.
SNM	1	6.20	.	6.20	6.20	.	.
STATION=BC07 YEAR=79 MONTH=3							
SND	2	24.70	19.37	11.00	38.40	375.38	78.44
SNM	2	5.50	4.95	2.00	9.00	24.50	90.00
STATION=BC07 YEAR=79 MONTH=4							
SND	1	3.00	.	3.00	3.00	.	.
SNM	0	.	.	.	.	.	.
STATION=BC07 YEAR=79 MONTH=11							
SND	2	6.10	8.63	0	12.20	74.42	141.42
SNM	2	1.10	1.56	0	2.20	2.42	141.42
STATION=BC07 YEAR=79 MONTH=12							
SND	2	22.40	0.28	22.20	22.60	0.08	1.26
SNM	2	5.10	0.42	4.80	5.40	0.18	8.32
STATION=BC07 YEAR=80 MONTH=1							
SND	1	30.80	.	30.80	30.80	.	.
SNM	1	5.80	.	5.80	5.80	.	.
STATION=BC07 YEAR=80 MONTH=2							
SND	2	25.10	1.56	24.00	26.20	2.42	6.20
SNM	2	6.30	1.27	5.40	7.20	1.62	20.20
STATION=BC07 YEAR=80 MONTH=3							
SND	2	18.40	2.83	16.40	20.40	8.00	15.37
SNM	2	5.40	0.00	5.40	5.40	0.00	0.00

*

SND = Snow Depth (cm)
SNM = Snow Moisture (cm)

Metric Conversion Factor = 2.54cm = 1.0in.

MONTHLY SNOW DEPTH AND SNOW MOISTURE STATISTICS

VARIABLE *	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	VARIANCE	C.V.
STATION=BC07 YEAR=80 MONTH=12							
SND	2	0	0	0	0	0	.
SNM	2	0	0	0	0	0	.
STATION=BC07 YEAR=81 MONTH=1							
SND	2	0	0	0	0	0	.
SNM	2	0	0	0	0	0	.
STATION=BC07 YEAR=81 MONTH=2							
SND	2	0	0	0	0	0	.
SNM	2	0	0	0	0	0	.
STATION=BC07 YEAR=81 MONTH=3							
SND	2	3.80	5.37	0	7.60	28.88	141.42
SNM	2	1.10	1.56	0	2.20	2.42	141.42
STATION=BC07 YEAR=81 MONTH=11							
SND	2	9.25	3.89	6.50	12.00	15.13	42.04
SNM	1	3.00	.	3.00	3.00	.	.
STATION=BC07 YEAR=82 MONTH=1							
SND	1	22.00	.	22.00	22.00	.	.
SNM	1	3.40	.	3.40	3.40	.	.
STATION=BC07 YEAR=82 MONTH=2							
SND	2	22.50	7.21	17.40	27.60	52.02	32.06
SNM	2	5.10	0.14	5.00	5.20	0.02	2.77

*

SND = Snow Depth (cm)
SNM = Snow Moisture (cm)

Metric Conversion Factor = 2.54cm = 1.0in.

MONTHLY SNOW DEPTH AND SNOW MOISTURE STATISTICS

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VARIABLE *      N        MEAN      STANDARD       MINIMUM       MAXIMUM       VARIANCE        C.V.
                                   DEVIATION       VALUE         VALUE

-------------------------------- STATION=HC08   YEAR=78   MONTH=12 ---------------------------------
SND             3        8.53        7.83            0           15.40          61.37         91.81
SNM             3        1.00        1.00            0            2.00           1.00        100.00

-------------------------------- STATION=HC08   YEAR=79   MONTH=1 ----------------------------------

SND             2        0           0               0            0              0              .
SNM             2        0           0               0            0              0              .
-------------------------------- STATION=BC08   YEAR=79   MONTH=2 ----------------------------------
SND             1        0           .               0            0              .              .
SNM             1        0           .               0            0              .              .
-------------------------------- STATION=BC08   YEAR=79   MONTH=3 ----------------------------------
SND             2        0           0               0            0              0              .
SNM             2        0           0               0            0              0              .
-------------------------------- STATION=HC08   YEAR=79   MONTH=4 - - - - - - - - - - - - - - - - - -
SND             1        3.20        .               3.20         3.20           .              .
SNM             0        .           .               .            .              .              .
-------------------------------- STATION=HC08   YEAR=79   MONTH=11 ---------------------------------
SND             1        0           .               0            0              .              .
SNM             1        0           .               0            0              .              .
-------------------------------- STATION=HC08   YEAR=79   MONTH=12 ---------------------------------
SND             2        1.80        2.55            0            3.60           6.48        141.42
SNM             2        0.70        0.99            0            1.40           0.98        141.42
-------------------------------- STATION=HC08   YEAR=80   MONTH=2 ----------------------------------
SND             2        0           0               0            0              0              .
SNM             2        0           0               0            0              0              .

-------------------------------- STATION=HC08   YEAR=80   MONTH=3 ----------------------------------

SND             2        0           0               0            0              0              .
SNM             2        0           0               0            0              0              .
```

*

SND = Snow Depth (cm)
SNM = Snow Moisture (cm)

Metric Conversion Factor = 2.54cm = 1.0in.

MONTHLY SNOW DEPTH AND SNOW MOISTURE STATISTICS

VARIABLE *	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	VARIANCE	C.V.
STATION=BC08 YEAR=80 MONTH=12							
SND	2	0	0	0	0	0	.
SNM	2	0	0	0	0	0	.
STATION=BC08 YEAR=81 MONTH=1							
SND	2	0	0	0	0	0	.
SNM	2	0	0	0	0	0	.
STATION=BC08 YEAR=81 MONTH=2							
SND	2	0	0	0	0	0	.
SNM	2	0	0	0	0	0	.
STATION=BC08 YEAR=81 MONTH=3							
SND	2	0	0	0	0	0	.
SNM	2	0	0	0	0	0	.
STATION=BC08 YEAR=82 MONTH=1							
SND	1	0	.	0	0	.	.
SNM	1	0	.	0	0	.	.
STATION=BC08 YEAR=82 MONTH=2							
SND	2	3.80	5.37	0	7.60	28.88	141.42
SNM	2	0.20	0.28	0	0.40	0.08	141.42

*
SND = Snow Depth (cm)
SNM = Snow Moisture (cm)

Metric Conversion Factor = 2.54cm = 1.0in.

MONTHLY SNOW DEPTH AND SNOW MOISTURE STATISTICS

VARIABLE *	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	VARIANCE	C.V.
STATION=BC09 YEAR=78 MONTH=12							
SND	3	22.37	5.47	16.10	26.20	29.94	24.47
SNM	3	3.60	1.83	1.60	5.20	3.36	50.92
STATION=BC09 YEAR=79 MONTH=1							
SND	2	38.30	9.19	31.80	44.80	84.50	24.00
SNM	2	5.50	1.27	4.60	6.40	1.62	23.14
STATION=BC09 YEAR=79 MONTH=2							
SND	1	24.60	.	24.60	24.60	.	.
SNM	1	5.20	.	5.20	5.20	.	.
STATION=BC09 YEAR=79 MONTH=3							
SND	2	19.00	16.12	7.60	30.40	259.92	84.85
SNM	2	4.70	4.10	1.80	7.60	16.82	87.26
STATION=BC09 YEAR=79 MONTH=4							
SND	1	2.60	.	2.60	2.60	.	.
SNM	0	.	.	.	.	.	.
STATION=BC09 YEAR=79 MONTH=11							
SND	2	4.30	6.08	0	8.60	36.98	141.42
SNM	2	0.90	1.27	0	1.80	1.62	141.42
STATION=BC09 YEAR=79 MONTH=12							
SND	2	21.50	1.84	20.20	22.80	3.38	8.55
SNM	2	3.50	0.99	2.80	4.20	0.98	28.28
STATION=BC09 YEAR=80 MONTH=1							
SND	1	28.80	.	28.80	28.80	.	.
SNM	1	3.80	.	3.80	3.80	.	.
STATION=BC09 YEAR=80 MONTH=2							
SND	2	23.60	5.66	19.60	27.60	32.00	23.97
SNM	2	5.20	1.70	4.00	6.40	2.88	32.64
STATION=BC09 YEAR=80 MONTH=3							
SND	2	5.60	3.39	3.20	8.00	11.52	60.61
SNM	2	1.70	0.99	1.00	2.40	0.98	58.23

*

SND = Snow Depth (cm)
SNM = Snow Moisture (cm)

Metric Conversion Factor = 2.54cm = 1.0in.

MONTHLY SNOW DEPTH AND SNOW MOISTURE STATISTICS

VARIABLE *	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	VARIANCE	C.V.
STATION=BC09 YEAR=80 MONTH=12							
SND	2	0	0	0	0	0	.
SNM	2	0	0	0	0	0	.
STATION=BC09 YEAR=81 MONTH=1							
SND	2	0	0	0	0	0	.
SNM	2	0	0	0	0	0	.
STATION=BC09 YEAR=81 MONTH=2							
SND	2	0	0	0	0	0	.
SNM	2	0	0	0	0	0	.
STATION=BC09 YEAR=81 MONTH=3							
SND	2	2.35	3.32	0	4.70	11.04	141.42
SNM	2	0.65	0.92	0	1.30	0.84	141.42
STATION=BC09 YEAR=81 MONTH=11							
SND	2	6.85	3.32	4.50	9.20	11.04	48.52
SNM	1	1.40	.	1.40	1.40	.	.
STATION=BC09 YEAR=82 MONTH=1							
SND	1	15.20	.	15.20	15.20	.	.
SNM	1	3.20	.	3.20	3.20	.	.
STATION=BC09 YEAR=82 MONTH=2							
SND	2	16.85	5.02	13.30	20.40	25.20	29.79
SNM	2	4.10	0.99	3.40	4.80	0.98	24.15

*

SND = Snow Depth (cm)
SNM = Snow Moisture (cm)

Metric Conversion Factor = 2.54cm = 1.0in.

MONTHLY SNOW DEPTH AND SNOW MOISTURE STATISTICS

VARIABLE *	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	VARIANCE	C.V.
STATION=BC13 YEAR=78 MONTH=12							
SND	3	40.43	4.10	36.00	44.10	16.84	10.15
SNM	3	4.07	0.81	3.20	4.80	0.65	19.88
STATION=BC13 YEAR=79 MONTH=1							
SND	2	59.00	8.20	53.20	64.80	67.28	13.90
SNM	2	8.90	5.23	5.20	12.60	27.38	58.79
STATION=BC13 YEAR=79 MONTH=2							
SND	1	52.20	.	52.20	52.20	.	.
SNM	1	12.00	.	12.00	12.00	.	.
STATION=BC13 YEAR=79 MONTH=3							
SND	2	55.10	14.28	45.00	65.20	204.02	25.92
SNM	2	13.20	1.98	11.80	14.60	3.92	15.00
STATION=BC13 YEAR=79 MONTH=4							
SND	1	51.60	.	51.60	51.60	.	.
SNM	1	9.40	.	9.40	9.40	.	.
STATION=BC13 YEAR=79 MONTH=11							
SND	2	10.30	7.50	5.00	15.60	56.18	72.77
SNM	2	1.50	0.14	1.40	1.60	0.02	9.43
STATION=BC13 YEAR=79 MONTH=12							
SND	2	33.60	4.53	30.40	36.80	20.48	13.47
SNM	2	5.80	0.28	5.60	6.00	0.08	4.88
STATION=BC13 YEAR=80 MONTH=1							
SND	1	38.80	.	38.80	38.80	.	.
SNM	1	4.60	.	4.60	4.60	.	.
STATION=BC13 YEAR=80 MONTH=2							
SND	2	53.30	3.25	51.00	55.60	10.58	6.10
SNM	2	11.20	1.13	10.40	12.00	1.28	10.10
STATION=BC13 YEAR=80 MONTH=3							
SND	2	53.60	2.83	51.60	55.60	8.00	5.28
SNM	2	13.70	1.56	12.60	14.80	2.42	11.35

*

SND = Snow Depth (cm)
SNM = Snow Moisture (cm)

Metric Conversion Factor = 2.54cm = 1.0in.

MONTHLY SNOW DEPTH AND SNOW MOISTURE STATISTICS

VARIABLE *	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	VARIANCE	C.V.
STATION=BC13	YEAR=80	MONTH=12					
SND	2	5.40	1.70	4.20	6.60	2.88	31.43
SNM	2	0.50	0.42	0.20	0.80	0.18	84.85
STATION=BC13	YEAR=81	MONTH=1					
SND	2	6.80	9.62	0	13.60	92.48	141.42
SNM	2	1.30	1.84	0	2.60	3.38	141.42
STATION=BC13	YEAR=81	MONTH=2					
SND	2	11.90	16.83	0	23.80	283.22	141.42
SNM	2	2.00	2.83	0	4.00	8.00	141.42
STATION=BC13	YEAR=81	MONTH=3					
SND	2	10.30	10.61	2.80	17.80	112.50	102.98
SNM	2	2.00	1.70	0.80	3.20	2.88	84.85
STATION=BC13	YEAR=81	MONTH=11					
SND	2	13.30	0.14	13.20	13.40	0.02	1.06
SNM	1	1.80	.	1.80	1.80	.	.
STATION=BC13	YEAR=82	MONTH=1					
SND	1	42.00	.	42.00	42.00	.	.
SNM	1	4.60	.	4.60	4.60	.	.
STATION=BC13	YEAR=82	MONTH=2					
SND	2	49.00	9.90	42.00	56.00	98.00	20.20
SNM	2	8.40	2.55	6.60	10.20	6.48	30.30
STATION=BC13	YEAR=82	MONTH=3					
SND	2	21.70	14.28	11.60	31.80	204.02	65.82
SNM	2	5.10	3.54	2.60	7.60	12.50	69.32

*

SND = Snow Depth (cm)
SNM = Snow Moisture (cm)

Metric Conversion Factor = 2.54cm = 1.0in.

TWO-YEAR SUMMARY OF SNOW DEPTH AND SNOW MOISTURE STATISTICS

12/1/78 - 11/30/80

VARIABLE *	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	VARIANCE	C.V.
SND	177	23.91	16.16	0	65.20	261.06	67.59
SNM	170	4.89	3.47	0	14.80	12.06	71.06

12/1/80 - 8/31/82

VARIABLE *	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	VARIANCE	C.V.
SND	128	7.83	10.83	0	56.00	117.23	138.21
SNM	118	1.62	2.30	0	10.20	5.30	141.69

*

SND = Snow Depth (cm)
SNM = Snow Moisture (cm)

Metric Conversion Factor = 2.54cm = 1.0in.

TRAFFIC LOAD

3.2 Traffic Load

This section contains vehicular and passenger load data along Piceance Creek road and into the C-b Oil Shale Tract.

Daily incoming vehicle counts taken at the C-b Guard Shack are presented in Table 3.2-1. These data are delineated into counts of cars and trucks from January 1982 to December 1982.

The C-b Shale Oil Project provided regular bus service for employees to and from the C-b Tract from April 1, 1978 to October 23, 1982. Table 3.2-2 summarizes bus passenger miles data for January through October 1982.

A program of monitoring vehicular traffic was initiated in March, 1978. Counters were placed at three stations:

1. BT01 - Rio Blanco Store.
2. BT02 - Cattleguard on CB access road.
3. BT03 - Rio Blanco Lake on Piceance Creek Road.

These data are recorded on paper tape, therefore vehicle type (i.e. car or truck) is unknown. Data are collected for a one-week interval once a month. Table 3.2-3 presents a summary of the traffic data collected at the three stations for June through December 1982.

TABLE 3.2-1

CATHEDRAL BLUFFS GUARD SHACK DAILY TRAFFIC COUNT - 1982

MONTH	DAY	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
January	Car	15	13	30	123	109	89	102	116	28	25	113	87	97	99	97	31	43	108	126	92	94	90	34	25	139	133	113	121	95	30	19
	Truck	0	0	0	11	5	6	3	3	0	0	3	5	4	5	6	0	0	4	5	2	7	4	2	0	3	3	4	9	4	0	0
February	Car	131	98	94	85	94	23	21	69	79	87	116	95	29	20	79	82	89	101	78	32	17	90	112	87	88	106	32	27	-	-	-
	Truck	2	7	7	6	5	0	0	8	5	10	10	3	1	0	2	8	1	13	7	1	0	4	9	3	3	0	0	0	-	-	-
March	Car	74	68	97	79	69	43	23	42	75	77	89	78	17	12	68	69	59	89	61	15	32	70	105	57	63	94	29	21	78	71	97
	Truck	7	11	8	4	3	0	0	4	7	3	5	5	0	5	0	5	1	4	4	0	0	5	7	5	4	7	0	0	2	3	5
April	Car	61	55	22	22	46	69	66	67	31	15	11	70	80	82	84	64	13	7	61	79	70	78	70	19	18	80	58	84	74	73	
	Truck	2	2	0	0	5	0	0	5	0	0	0	7	5	5	5	3	2	0	4	3	4	3	0	0	0	4	5	0	0	1	
May	Car	13	11	72	77	74	76	68	10	6	72	71	46	58	57	6	15	68	57	64	49	58	6	6	64	62	76	71	30	8	6	8
	Truck	0	0	5	5	3	3	4	0	0	2	1	0	2	2	0	0	2	0	4	6	0	0	0	0	0	1	2	1	0	0	0
June	Car	62	53	37	51	6	5	70	49	65	53	56	9	14	67	68	55	66	62	19	10	64	51	64	63	48	6	13	62	57	66	-
	Truck	4	3	0	4	0	0	3	1	2	5	3	0	0	3	3	3	4	2	0	0	1	3	1	0	1	0	0	2	3	3	-
July	Car	55	48	8	11	14	66	66	63	57	13	15	66	64	84	60	62	18	11	52	61	56	64	29	27	16	68	64	47	74	64	40
	Truck	0	0	0	1	0	3	2	1	3	2	0	2	4	6	0	0	0	0	3	0	0	2	3	0	0	6	1	1	2	2	0
August	Car	37	51	60	56	59	55	49	9	54	59	49	52	55	39	33	53	55	49	75	54	36	34	54	53	60	59	53	17	16	41	45
	Truck	1	5	3	2	2	1	0	0	1	3	3	0	1	0	0	0	0	0	2	1	0	0	1	0	1	2	0	0	1	2	2
September	Car	45	60	51	12	27	18	40	56	49	41	16	11	44	43	44	41	36	17	17	38	41	45	62	50	19	7	43	41	35	38	-
	Truck	1	2	1	0	1	0	2	0	2	0	0	0	3	0	6	1	1	0	0	5	1	1	4	3	0	0	1	1	2	2	-
October	Car	37	14	8	40	48	49	34	31	10	9	43	46	41	43	38	10	8	27	24	29	44	17	8	6	45	35	37	41	32	14	16
	Truck	0	0	0	1	4	6	2	4	0	0	0	3	0	3	0	0	0	2	1	0	0	1	0	0	1	2	2	2	1	0	0
November	Car	48	41	40	41	27	7	10	39	35	34	34	24	10	7	36	36	39	43	38	19	21	31	31	37	7	20	15	21	51	44	-
	Truck	1	0	1	2	0	0	0	1	1	1	2	2	0	0	2	4	0	3	1	0	0	2	0	1	0	1	0	0	1	1	-
December	Car	39	59	46	10	13	40	45	37	33	28	21	21	35	32	29	38	36	20	24	32	33	29	21	7	6	6	23	18	18	14	6
	Truck	0	2	1	0	0	3	1	3	2	1	0	1	2	1	1	0	2	0	0	2	4	1	1	0	0	0	1	2	2	1	0

TABLE 3.2-2

1982 MONTHLY BUS STATISTICS FOR CB

Month	Round Trip CB-Rifle	Round Trip CB-Meeker	Round Trip Passengers Rifle	Round Trip Passengers Meeker	Average Passengers/Trip* Rifle	Average Passengers/Trip* Meeker
June	112	112	774	1005	6.9	9.0
July	54	54	521	666	9.7	12.3
August	22	22	457	508	20.8	23.1
Sept.	21	21	357	264	17.0	12.6
Oct.	16	16	210	119	13.1	7.4
Nov.	**					
Dec.						

* Bus capacity is 47.
** Bussing program discontinued 10/23/82.

TABLE 3.2-3
C-B STEVENS RECORDER TRAFFIC COUNT

JUNE 1982 - DECEMBER 1982

			LOCATION BT01		BT02		BT03	
YEAR	MONTH	DAY	IN TRAFFIC	OUT TRAFFIC	IN TRAFFIC	OUT TRAFFIC	IN TRAFFIC	OUT TRAFFIC
82	6	1			330	101	155	144
		2			150	57	74	113
		21			262	8	16	36
		22	123	136			117	134
		23	158	176			146	124
		24	153	193			147	137
		25	107	53			151	157
		26					127	106
		27					93	104
		28					121	81
	7	8			27	13		
	8	2	48	84	27	62	22	30
		3	150	145	80	82	111	121
		4	137	157	98	104	126	105
		5	140	154	95	93	105	105
		6	127	129	70	69	101	103
		7	108	106	49	57	64	101
		8	97	78			74	70
		9	151	128			75	68
		10	49	5				
		26			66	88	75	93
		27			80	83	81	73
		28			26	27	65	72
		29			31	32	55	53
		30			64	73	113	98
		31			70	68	84	85
	9	1			65	30	56	50
		20			9	3	17	15
		21	55	112	75	75	105	100
		22	139	128	73	76	108	123
		23	152	151	86	85	112	105
		24	175	177	77	81	102	109
		25	107	124	34	33	78	83
		26	101	110	22	20	67	67
		27	165	175	61	56	118	116
		28	169	169	55	57	121	148
		29	77	33	51	56	175	161
		30			5	19	12	8
	11	4	94	122	2	13	29	36
		5	484	272	3	54	190	188
		6	305	267	2	14	162	147

TABLE 3.2-3 (Contd)
C-B STEVENS RECORDER TRAFFIC COUNT

JUNE 1982 - DECEMBER 1982

			LOCATION					
			BT01		BT02		BT03	
YEAR	MONTH	DAY	IN TRAFFIC	OUT TRAFFIC	IN TRAFFIC	OUT TRAFFIC	IN TRAFFIC	OUT TRAFFIC
82	11	7	347	347	7	19	174	197
		8	333	402	3	2	222	230
		9	317	379			239	251
		10	240	386			215	215
		11	277	236			114	125
		12	187	205			77	99
		13	161	160			73	69
		14	137	135			73	75
		15	176	165			74	91
		16	190	193			72	94
		17	189	177			96	128
		18	153	66			95	107
		19					16	2
	12	10	17	26	4	15	13	23
		11	113	95	43	32	76	103
		12	106	92	32	26	80	93
		13	147	89	73	54	70	76
		14	119	80	66	49	66	67
		15	143	104	62	50	79	85
		16	109	102	57	42	71	71
		17	128	128	63	55	80	72
		18	80	91	34	24	53	58
		19	81	77	46	29	40	57
		20	94	107	44	36	60	47
		21	70	58				
TOTAL			7485	7284	2679	2122	5978	6204

4.0 Data Automation

The enviromental data base at present is partially manual and partially computerized. For purposes of analysis, data specificity, data security, and data archiving, the data base is being further computerized. It is the intent that all "indicator variables" be entered into RAMIS (Rapid Access Management Information System). Toward this end computer codes have been designated for all environmental station locations.

This section presents the status of automated data base, station location data, and a cross-reference list of four-digit computer codes and station monitoring codes.

AUTOMATION
STATUS

4.1 Automation Status

This section presents the status of the automated data base for the C-b Tract environmental data stored on the Occidental Petroleum Corporation computer system in Houston, Texas.

RAMIS II is a computerized data base management system (DBMS) used by the C-b Shale Oil Project via the Occidental Computer Center in Houston, Texas. C-b Shale Oil Tract environmental data are entered into RAMIS DBMS as a means of making relevant data available for subsequent retrievals for use in reports and impact analyses. The use of this system provides an economical way to store and retrieve selected data in formats desired for reports and for input to analytic models requiring the data. Data are also archived within this system and through magnetic tapes containing the source raw data.

The following environmental data are entered into RAMIS DBMS:

Water Quality	
Springs and Seeps	October 1974 thru November 1981
Alluvial Wells	October 1974 thru November 1981
Deep Bedrock Wells	October 1974 thru December 1982
Field Measurements	
Springs and Seeps	October 1974 thru December 1982
Alluvial Wells	October 1974 thru December 1982
Deep Bedrock Wells	October 1974 thru December 1982
Levels and Flows	
Well Levels	October 1974 thru December 1982
Spring Flows	October 1974 thru December 1982
Water Augmentation Plan	
Springs and Seeps	July 1979 thru October 1982
Deep Bedrock Wells	August 1979 thru October 1982
Precipitation	January 1979 thru April 1982
National Pollutant Discharge Elimination System	
Water Quality Data	July 1979 thru December 1982
Water Usage	June 1980 thru December 1982
Well Reinjection	March 1981 thru June 1982 (Discontinued)
Air Quality & Meteorology	
Weather Stations (Station AD42)	October 1974 thru March 1982
(Station AD56)	October 1974 thru August 1980
(Station AD20)	February 1982 thru July 1982

4.1 Automation Status (Continued)

Air Quality & Meteorology (Continued)	
Large Trailer (Station AB20)	October 1974 thru January 1982 (Discontinued)
Large Trailer (Station AB23)	October 1974 thru December 1982
Large Trailer (Station AB26)	October 1981 thru March 1982
Meteorological Tower (Station AA23)	October 1974 thru December 1982
Traffic	February 1980 thru December 1982
Biology	
Microclimate	October 1974 thru December 1982
Deer Kill	October 1977 thru December 1982
Deer Count	Sept. 1977 thru December 1982
Avifauna	1977 thru 1981

The status of the files are shown in Figures 4.1-1 through 4.1-9. File descriptions for the 22 files that reside in the RAMIS data base are shown in Tables 4.1-1 through 4.1-4.

Data collected and analyzed by USGS for stream flow and stream water quality are stored in government computer data bases in Reston, Virginia. These data bases (WATSTOR) and (NAWDEX) are accessed by dialing computer communications for retrievals of data to the Grand Junction computers for printing and analyses.

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* These files contain data for studies which have been discontinued.

FIGURE 4.1-1

```
WATER QUALITY - UPPER AQUIFER WELLS
 SAMPLING TIME INTERVAL
     DATABASE STATUS


                YR
                82
                MO
                 8  11   12
 COMPUTER CODE
----------------------------
 WX32                X
 WX44           X        X
```

```
WATER QUALITY - LOWER AQUIFER WELLS
SAMPLING TIME INTERVAL
   DATABASE STATUS


                YR
                82
                MO
                 8   12
 COMPUTER CODE
------------------------
 WY45           X    X
 WY81           X
```

```
WATER QUALITY - BEDROCK WELLS
   SAMPLING TIME INTERVAL
       DATABASE STATUS


                YR
                82
                MO
                 8   9   11  12
 COMPUTER CODE
--------------------------------
 WD12                    X
 WD20                        X
 WD57                    X
 WD90           X        X
 WE20                        X
 WG12                    X
 WG20               X


WC = UINTAH
WD = UPC1
WE = UPC2
WG = UPC3
WH = UPC4
```

FIGURE 4.1-1 (Contd)

```
WATER QUALITY - INJECTION WELLS
SAMPLING TIME INTERVAL
 DATABASE STATUS


                  YR
                  82
                  MO
                   6
 COMPUTER CODE
--------------------
 WI18             X
```

```
WATER QUALITY - SEEPAGE MONITORING WELLS
      SAMPLING TIME INTERVAL
          DATABASE STATUS


              YR
              82
              MO
               6   8   9  10  11  12
COMPUTER CODE
----------------------------------------
WW13           X   X
WW22           X   X   X   X   X   X
WW32           X       X
```

FIGURE 4.1-2

```
WATER QUALITY - DISCHARGE STATIONS
     SAMPLING TIME INTERVAL
         DATABASE STATUS


                    YEAR
                    82
                    MONTH
                     7    8    9   10   11   12
COMPUTER CODE
---------------------------------------------------
WN40                X    X    X    X    X    X
WN41                X    X    X    X    X    X
WN42                X    X    X    X    X    X
WU02                X    X    X    X    X    X
```

```
WATER QUALITY - DISCHARGE STATIONS
QUARTERLY SAMPLING INTERVAL
   DATABASE STATUS


                YR
                82
                MO
                 7   10
COMPUTER CODE
------------------------
WN40            X    X
```

FIGURE 4.1.3

SPRINGS - FLOW
SAMPLING TIME INTERVAL
DATABASE STATUS

COMPUTER CODE	YR 82 MO 6	7	8	9	10	11	12
WS01						X	X
WS02					X	X	X
WS03						X	X
WS04	X	X	X	X	X	X	X
WS06	X	X	X	X	X	X	X
WS07	X	X	X	X	X	X	X
WS08					X	X	X
WS09					X	X	X
WS10					X	X	X
WS11	X	X		X	X	X	X
WS12	X	X	X	X	X	X	X
WS21	X						
WS22	X						
WS23	X						
WS24	X						
WS26	X						
WS30					X		
WS31	X						
WS34	X						
WS36						X	X
WS66	X	X	X	X	X		X

FIGURE 4.1-4

WATER LEVEL - ALLUVIAL WELLS
SAMPLING TIME INTERVAL
DATABASE STATUS

	YR 82 MO 6	7	8	9	10	11	12
COMPUTER CODE							
WA01	X	X	X	X	X	X	X
WA02	X	X	X	X	X	X	X
WA03	X	X	X	X	X	X	X
WA05	X	X	X	X	X	X	X
WA06	X	X	X	X	X	X	X
WA07	X	X	X	X	X	X	X
WA08	X	X	X	X	X	X	X
WA09	X	X	X	X	X	X	X
WA11	X	X	X	X	X	X	X
WA12	X	X	X	X	X	X	X
WA55	X	X	X	X	X		
WA56	X	X	X	X	X		

WATER LEVEL - COMPOSITE WELLS
SAMPLING TIME INTERVAL
DATABASE STATUS

	YR 82 MO 6	7	8	9	10	11	12
COMPUTER CODE							
WV01		X			X		
WV02		X			X		
WV03		X			X		
WV04		X			X		
WV05		X			X		
WV10		X	X				
WV37	X	X	X	X	X	X	X

FIGURE 4.1-4 (Contd)

WATER LEVEL - UPPER AQUIFER WELLS
SAMPLING TIME INTERVAL
DATABASE STATUS

COMPUTER CODE	YR 82 MO 6	7	8	9	10	11	12
WX32	X	X	X	X	X		X
WX38	X	X	X	X	X	X	X
WX44	X	X	X	X	X	X	X
WX64		X			X		
WX65		X			X		
WX67		X			X		
WX69		X			X		
WX71					X		
WX72		X			X		
WX73		X			X		

WATER LEVEL - LOWER AQUIFER WELLS
SAMPLING TIME INTERVAL
DATABASE STATUS

COMPUTER CODE	YR 82 MO 6	7	8	9	10	11	12
WY44	X	X	X	X	X	X	X
WY45	X	X	X	X	X	X	X
WY46	X	X	X	X	X		X
WY64		X			X		
WY65		X			X		
WY66		X			X		
WY67		X			X		
WY68		X			X		
WY69		X			X		
WY70		X			X		
WY71		X			X		
WY72		X			X		
WY75		X			X		
WY76		X			X		
WY77		X			X		
WY78		X			X		
WY79		X			X		
WY81	X	X	X	X	X	X	X

FIGURE 4.1-4 (Contd)

WATER LEVEL - BEDROCK WELLS
SAMPLING TIME INTERVAL
DATABASE STATUS

COMPUTER CODE	YR 82 MO 6	7	8	9	10	11	12
WC17	X		X		X		X
WC91	X		X				
WD02	X	X	X	X	X	X	X
WD11				X			
WD12	X	X	X	X	X	X	X
WD14	X	X	X	X	X	X	X
WD15	X	X	X	X	X	X	X
WD17	X		X		X		X
WD18		X			X		
WD19	X	X	X	X	X	X	X
WD20	X		X	X	X	X	X
WD21	X	X	X	X		X	X
WD41	X	X	X		X		X
WD51	X	X	X	X		X	X
WD52	X	X	X	X	X	X	X
WD57	X		X		X		X
WD61	X	X	X	X	X	X	X
WD90	X	X	X	X		X	X
WD91	X		X				
WE03	X	X	X	X	X	X	X
WE04	X	X	X	X	X	X	X
WE11				X			
WE17	X		X		X		X
WE18		X			X		
WE20	X	X	X	X	X	X	X
WE21	X	X	X	X		X	X
WE41	X	X	X		X		X
WE51	X	X	X	X		X	X
WE52	X	X	X	X	X	X	X
WE61	X	X	X	X	X	X	X
WE91	X		X				
WG12	X	X	X	X	X	X	X
WG17	X		X		X		X
WG18		X			X		
WG20						X	X
WG21	X	X	X	X		X	X
WG41	X	X	X		X		X
WG51	X	X	X	X		X	X
WG52	X	X	X	X	X	X	X
WG61	X	X	X	X	X	X	X
WG91	X		X				
WH21	X	X	X	X		X	X

WC = UINTAH
WD = UPC1
WE = UPC2
WG = UPC3
WH = UPC4

FIGURE 4.1-4 (Contd)

```
              WATER LEVEL - INJECTION WELLS
                 SAMPLING TIME INTERVAL
                     DATABASE STATUS


                    YR
                    82
                    MO
                     6   7   8   9  10  11  12
COMPUTER CODE
-------------------------------------------------
WI17                X   X   X   X   X   X   X
WI19                X   X   X   X   X   X   X
```

```
WATER LEVEL - SEEPAGE MONITORING WELLS
        SAMPLING TIME INTERVAL
            DATABASE STATUS


                    YR
                    82
                    MO
                     6   7   8   9  10  11  12
COMPUTER CODE
-------------------------------------------------
WW13                X   X   X   X   X   X   X
WW22                X   X   X   X   X   X   X
WW32                X   X   X   X   X   X   X
```

```
                   WATER LEVEL - SHAFT
                 SAMPLING TIME INTERVAL
                     DATABASE STATUS


                    YR
                    82
                    MO
                     6   7   8   9  10  11  12
COMPUTER CODE
-------------------------------------------------
WZ01                X   X   X   X   X   X   X
```

FIGURE 4.1-4 (Contd)

```
      WELL LEVELS OF VARIOUS WELLS
CONTINUOUS 1-HOUR SAMPLES - HIGHEST DAILY LEVEL
              DATABASE STATUS


                 YEAR
                 82
                 MONTH
                  6   7   8   9  10  11  12
 COMPUTER CODE
----------------------------------------------
 WD12            X   X   X   X   X   X
 WD90                                X   X
 WG12            X   X   X   X   X   X   X
 WS04            X   X   X   X   X   X   X
 WS11            X   X   X   X   X   X   X
 WS12            X   X   X   X   X   X   X
 WX32            X   X
 WX38            X   X   X   X   X   X   X
 WY44            X   X   X   X   X
```

FIGURE 4.1-5

```
                    AIR QUALITY MONITORING
                    SAMPLING TIME INTERVAL
                       DATABASE STATUS


                           YEAR
                           82
                           MONTH
                           10   11   12   6    7    8    9
              COMPUTER CODE
             ------------------------------------------------
              23           X    X    X    X    X    X    X



                   METEOROLOGICAL MONITORING
                    SAMPLING TIME INTERVAL
                       DATABASE STATUS


                           YEAR
                           82
                           MONTH
                           10   11   12   6    7    8    9
              COMPUTER CODE
             ------------------------------------------------
              23           X    X    X    X    X    X    X



              MECHANICAL WEATHER STATIONS
                SAMPLING TIME INTERVAL
                    DATABASE STATUS


                       YEAR
                       82
                       MONTH
                       10   11   12   6    7    8    9
          COMPUTER CODE
         ------------------------------------------------
          AD20                          X    X
          AD28         X    X    X      X    X    X    X


         STATION AD20 INCLUDES DATA FOR WIND SPEED AND DIRECTION,
             TEMPERATURE AND PRECIPITATION
         STATION AD28 INCLUDES PRECIPITATION DATA ONLY
```

FIGURE 4.1-6

```
                  PARTICULATE LEVEL
     24-HOUR CONTINUOUS SAMPLE EVERY 4TH DAY
                   DATABASE STATUS

                YEAR
                82
                MONTH
                 6   7   8   9  10  11  12
COMPUTER CODE
-------------------------------------------
023             X   X   X   X   X   X   X
026             X   X
```

FIGURE 4.1-7

```
                VISUAL RANGE
            SAMPLING TIME INTERVAL
               DATABASE STATUS

                YEAR
                82
                MONTH
                 6   7   8   9  10  11  12
COMPUTER CODE
-------------------------------------------
AREA            X   X   X   X   X   X   X
```

FIGURE 4.1-8

DEER ROAD COUNT
SAMPLING TIME INTERVAL
DATABASE STATUS

	YEAR 82 MONTH		
COMPUTER CODE	9	10	12
BM00	X	X	X
BM01	X	X	X
BM02	X	X	X
BM03	X	X	X
BM04	X	X	X
BM05	X	X	X
BM06		X	
BM07	X	X	X
BM08	X	X	X
BM09	X	X	X
BM10	X	X	
BM11	X	X	X
BM12	X	X	
BM13	X	X	
BM14	X	X	
BM15	X	X	
BM16	X	X	
BM17	X	X	X
BM18	X	X	
BM19	X	X	X
BM20	X	X	
BM21	X	X	
BM22	X	X	X
BM23	X	X	
BM24	X	X	X
BM25			X
BM26	X	X	
BM27	X	X	
BM28	X	X	X
BM29			X
BM31	X	X	
BM32	X	X	
BM33	X	X	
BM34	X	X	
BM35	X	X	X
BM36	X	X	
BM37	X	X	X
BM38	X	X	X
BM39	X	X	X
BM40	X	X	X
BM41	X	X	

FIGURE 4.1-9

DEER KILL ROAD COUNT
SAMPLING TIME INTERVAL
DATABASE STATUS

	YEAR 82 MONTH		
COMPUTER CODE	9	10	12
BN00	X	X	
BN09			X
BN11			X
BN19			X
BN24			X
BN34			X
BN39			X

FIGURE 4.1-10

MICROCLIMATIC MONITORING
SAMPLING TIME INTERVAL
DATABASE STATUS

	YEAR 82 MONTH						
COMPUTER CODE	6	7	8	9	10	11	12
BC01							X
BC03	X	X	X	X	X	X	X
BC05	X	X	X	X	X	X	X
BC07	X	X	X	X	X	X	X
BC09	X	X	X	X	X	X	X

FIGURE 4.1-11

TRAFFIC COUNT
CONTINUOUS COUNT FOR MONTHLY 1 WEEK INTERVALS
DATABASE STATUS

	YEAR 82 MONTH					
COMPUTER CODE	6	7	8	9	11	12
BT01	X		X	X	X	X
BT02	X	X	X	X	X	X
BT03	X		X	X	X	X

TABLE 4.1-1

```
      DESCRIPTION FOR RAMIS FILE NPDES
               02/01/83

                                                   LEVEL   SEGMENT
 LIST    FIELDNAME      SYNONYM           LEVEL    TYPE    FACTOR    TYPE   LENGTH
 ----    ---------      -------           -----    -----   -------   ----   ------
    1    LOCATION       LOC                 1      S          1       A      4
    2    YEAR           YR                  1      S          1       I      2
    3    MONTH          MO                  1      S          1       I      2
    4    DAY            DY                  1      S          1       I      2
    5    FLOW           FLW                 2      S          0       F      6.1
    6    TOTSUSSOLID    TSS                 2      S          0       F      6.1
    7    TOTDISSOLID    TDS                 2      S          0       F      6.1
    8    FLORIDE        F                   2      S          0       F      6.2
    9    BORON          B                   2      S          0       F      6.2
   10    AMMONIA        NH3                 2      S          0       F      6.2
   11    PHENOL         PHEN                2      S          0       F      6.3
   12    ALUMINUM       AL                  2      S          0       F      6.1
   13    IRON           FE                  2      S          0       F      6.2
   14    OLGR           OLGR                2      S          0       I      5
   15    PH             PH                  2      S          0       F      5.2
   16    CADMIUM        CD                  2      S          0       F      6.2
   17    COPPER         CU                  2      S          0       F      6.2
   18    MERCURY        HG                  2      S          0       D      8.5
   19    SILVER         AG                  2      S          0       F      6.2
   20    ZINC           ZN                  2      S          0       F      6.2
   21    SPC            SPC                 2      S          0       F      7.1
   22    DO             DO                  2      S          0       F      5.2
   23    TEMP           TEMP                2      S          0       F      5.1
   24    FTOTSUSSOLID   FTSS                2      S          0       F      5.1
   25    COD            COD                 2      S          0       F      7.3
   26    FLORIDE/FLD    FF                  2      S          0       F      7.1
   27    TOTALALK       TALK                2      S          0       F      7.1
   28    BICARBONATE    HCO3                2      S          0       F      7.1

RP0808: NUMBER OF RECORDS IN TABLE=        28  LINES=     28
```

TABLE 4.1-1 (Contd)

```
       DESCRIPTION FOR RAMIS FILE NPDESSA
                02/01/83

                                                      LEVEL   SEGMENT
LIST   FIELDNAME      SYNONYM            LEVEL   TYPE    FACTOR    TYPE   LENGTH
----   ---------      -------            -----   -----   -------   ----   ------
   1   LOCATION       LOC                1       S             1   A      4
   2   YEAR           YR                 1       S             1   I      2
   3   MONTH          MO                 1       S             1   I      2
   4   DAY            DY                 1       S             1   I      2
   5   TOTDISSOLID    TDS                2       S             1   F      6.1
   6   FLORIDE        F                  2       S             1   F      6.2
   7   BORON          B                  2       S             1   F      6.2
   8   AMMONASN       NH3                2       S             1   F      6.3
   9   PHENOL         PHEN               2       S             1   F      6.3
  10   OILGREASE      OG                 2       S             1   F      6.2
  11   TMERCURY       THG                2       S             1   D      8.5
  12   TALUMINUM      TAL                2       S             1   F      6.2
  13   TARSENIC       TARS               2       S             1   F      6.2
  14   TBARIUM        TBA                2       S             1   F      6.2
  15   TCADMIUM       TCD                2       S             1   F      6.2
  16   CALCIUM        CA                 2       S             1   F      6.2
  17   TCHROMIUM      TCR                2       S             1   F      6.2
  18   TCOPPER        TCU                2       S             1   F      6.2
  19   TIRON          TFE                2       S             1   F      6.2
  20   TLEAD          TPB                2       S             1   F      6.2
  21   TLITHIUM       TLI                2       S             1   F      6.2
  22   MAGNESIUM      MG                 2       S             1   F      6.2
  23   TMANGANESE     TMN                2       S             1   F      6.2
  24   TMOLYBDENUM    TMO                2       S             1   F      6.2
  25   TNICKEL        TNI                2       S             1   F      6.2
  26   TPOTASSIUM     TKA                2       S             1   F      6.2
  27   SELENIUM       SE                 2       S             1   D      8.4
  28   TSILVER        TAG                2       S             1   F      6.2
  29   TSODIUM        TNA                2       S             1   F      6.2
  30   TSTRONTIUM     TSR                2       S             1   F      6.2
  31   TZINC          TZN                2       S             1   F      6.2
  32   TTITANIUM      TTI                2       S             1   F      6.2
  33   TVANADIUM      TV                 2       S             1   F      6.2
  34   COD            COD                2       S             1   F      6.2
  35   TOTALK         TALK               2       S             1   F      6.1
  36   KJELDAHL       KJL                2       S             1   F      6.2
  37   BICARBONATE    HCO3               2       S             1   F      6.1
  38   BROMIDE        BR                 2       S             1   F      6.1
  39   CARBONATE      CO3                2       S             1   F      6.1
  40   CHLORIDE       CL                 2       S             1   F      6.1
  41   NITRATE        NO3                2       S             1   F      6.1
  42   SULFATE        SO4                2       S             1   F      6.1
  43   SULFIDE        SO3                2       S             1   F      6.1
  44   SILICA         SIO2               2       S             1   F      6.1
  45   ALPHA          ALP                2       S             1   F      6.1
  46   BETA           BET                2       S             1   F      6.1
  47   RADIUM226      R226               2       S             1   F      6.3
  48   URANIUM        U                  2       S             1   D      8.4
```

TABLE 4.1-1 (Contd)

```
       DESCRIPTION FOR RAMIS FILE NPDESSA
              02/01/83

                                                    LEVEL   SEGMENT
LIST   FIELDNAME      SYNONYM         LEVEL   TYPE    FACTOR     TYPE    LENGTH
----   ----------     --------        -----   -----   -------    ----    -----
  49   TZIRCONIUM     TZR               2     S           1      F       6.3
  50   TBERYLLIUM     TBE               2     S           1      F       6.3
  51   TBISMUTH       TBI               2     S           1      F       6.3
  52   TGERMANIUM     TGR               2     S           1      F       6.3
  53   TGALLIUM       TGA               2     S           1      F       6.3
  54   CYANIDE        CYAN              2     S           1      F       6.3
  55   CONDUCTIVITY   COND              2     S           1      F       6.1
  56   PH             PH                2     S           1      F       5.1
  57   DOC            DOC               2     S           1      F       6.1
  58   HPHOBICTOT     HPBT              2     S           1      F       6.1
  59   HPHOBICBAS     HPBB              2     S           1      F       6.1
  60   HPHOBICACD     HPBA              2     S           1      F       6.1
  61   HPHOBICNTL     HPBN              2     S           1      F       6.1
  62   HPHILICTOT     HPLT              2     S           1      F       6.1
  63   HPHILICBAS     HPLB              2     S           1      F       6.1
  64   HPHILICACD     HPLA              2     S           1      F       6.1
  65   HPHILICNTL     HPLN              2     S           1      F       6.1
  66   NTRANTRI       NN                2     S           1      F       6.3
  67   TEMP           TEMP              2     S           1      F       6.2
  68   SUSSOLD        SUSS              2     S           1      F       6.2
  69   TCS            TCESIUM137        2     S           1      F       6.2
  70   SR90           SR90              2     S           1      F       6.2
  71   DO             DO                2     S           1      F       6.2
  72   NITRITE        NO3               2     S           1      F       6.2
  73   TOC            TOC               2     S           1      F       6.2
  74   FLORIDE/FLO    FF                2     S           1      F       6.2
  75   TSS/FLO        TSSF              2     S           1      F       6.2
  76   THIOCYANATE    SCN               2     S           1      F       6.2
  77   DUMMY2         DM2               2     S           1      F       6.2
  78   DUMMY3         DM3               2     S           1      F       6.2

RR080R: NUMBER OF RECORDS IN TABLE=       78  LINES=     78
```

TABLE 4.1-1 (Contd)

```
        DESCRIPTION FOR RAMIS FILE SHAFTGW
                02/01/83

                                                    LEVEL   SEGMENT
LIST   FIELDNAME      SYNONYM              LEVEL    TYPE    FACTOR     TYPE   LENGTH
----   ---------      -------              -----    -----   -------    ----   ------
   1   LOCATION       LOC                  1        S             1    A      4
   2   YEAR           YR                   2        S             1    I      2
   3   MONTH          MO                   2        S             1    I      2
   4   DAY            DY                   3        S             1    I      2
   5   GROUT          GRT                  3        S             1    I      2
   6   PROBEHOLE      PBH                  3        S             1    A      2
   7   DEPTH          DP                   3        S             1    I      5
   8   ELEVATION      ELV                  3        S             1    I      5
   9   GPM            GPM                  3        S             1    I      4
  10   ALUMINUM       AL                   3        S             1    F      6.3
  11   ARSENIC        ARS                  3        S             1    F      6.3
  12   BARIUM         BA                   3        S             1    F      6.2
  13   BORON          B                    3        S             1    F      6.2
  14   CADMIUM        CD                   3        S             1    F      6.3
  15   CALCIUM        CA                   3        S             1    F      6.1
  16   CHROMIUM       CR                   3        S             1    F      6.3
  17   COBALT         CO                   3        S             1    F      6.3
  18   COPPER         CU                   3        S             1    F      6.3
  19   IRON           FE                   3        S             1    F      6.2
  20   LEAD           PB                   3        S             1    F      6.3
  21   LITHIUM        LI                   3        S             1    F      6.2
  22   MAGNESIUM      MG                   3        S             1    F      6.1
  23   MANGANESE      MN                   3        S             1    F      6.3
  24   MERCURY        HG                   3        S             1    F      8.5
  25   MOLYBDENUM     MOLY                 3        S             1    F      6.3
  26   NICKEL         NI                   3        S             1    F      6.3
  27   POTASSIUM      K                    3        S             1    F      6.1
  28   SELENIUM       SE                   3        S             1    F      6.3
  29   SILVER         AG                   3        S             1    F      6.3
  30   SODIUM         NA                   3        S             1    F      7.1
  31   STRONTIUM      SR                   3        S             1    F      6.1
  32   VANADIUM       V                    3        S             1    F      6.3
  33   ZINC           ZN                   3        S             1    F      6.3
  34   ALKALINITY     ALK                  3        S             1    F      7.1
  35   BICARBONATE    HCO3                 3        S             1    F      7.1
  36   CARBONATE      CO3                  3        S             1    F      6.1
  37   BROMIDE        BR                   3        S             1    F      6.3
  38   CHLORIDE       CL                   3        S             1    F      7.1
  39   FLUORIDE       F                    3        S             1    F      6.2
  40   HARDNESS       HARD                 3        S             1    F      7.1
  41   AMMONIA        NH3                  3        S             1    F      6.3
  42   KJELDNIT       KJN                  3        S             1    F      6.1
  43   NITRATE        NO3                  3        S             1    F      6.2
  44   BIOOXYDEMD     BOD                  3        S             1    F      6.1
  45   CHEMOXYDEM     COD                  3        S             1    F      7.1
  46   OILGREASE      OLGR                 3        S             1    F      6.1
  47   PHENOLS        PHEN                 3        S             1    F      6.4
  48   SILICA         SLC                  3        S             1    F      6.1
  49   SOLIDSDISS     TDS                  3        S             1    F      7.1
  50   SUSSOLID       SUSS                 3        S             1    F      7.1
  51   SULFATE        SO4                  3        S             1    F      6.1
  52   TURBIDITY      TURB                 3        S             1    F      7.1
  53   DISSORGCARB    DOC                  3        S             1    F      6.1
  54   TOTALCOLIF     TCOLIF               3        S             1    F      6.1
  55   FECALCOLIF     FCOLIF               3        S             1    F      6.1
  56   PH             PH                   3        S             1    F      5.2
  57   SPECCOND       SPC                  3        S             1    F      6.1
  58   DISSOXY        DO                   3        S             1    F      5.1
  59   TEMP           TEMP                 3        S             1    F      4.1
  60   DUM1           DUM1                 3        S             1    F      6.1
  61   DUM2           DUM2                 3        S             1    F      6.1
  62   DUM3           DUM3                 3        S             1    F      6.1
  63   DUM4           DUM4                 3        S             1    F      6.1

RPJAUB: NUMBER OF RECORDS IN TABLE=          63   LINES=      63
```

TABLE 4.1-1 (Contd)

```
       DESCRIPTION FOR RAMIS FILE STEVEN
                  02/01/83

                                                    LEVEL   SEGMENT
LIST    FIELDNAME         SYNONYM           LEVEL   TYPE    FACTOR     TYPE   LENGTH
----    ---------         -------           -----   -----   -------    ----   ------
   1    LOCATION          LOC               1       S             1    A      4
   2    YEAR              YR                1       S             1    I      2
   3    MONTH             MO                1       S             1    I      2
   4    DAY               DY                2       S             1    I      2
   5    DEPTH             DP                2       S             1    F      7.2

 RP0808: NUMBER OF RECORDS IN TABLE=         5  LINES=       5
```

```
       DESCRIPTION FOR RAMIS FILE WTRLEV
                  02/01/83

                                                    LEVEL   SEGMENT
LIST    FIELDNAME         SYNONYM           LEVEL   TYPE    FACTOR     TYPE   LENGTH
----    ---------         -------           -----   -----   -------    ----   ------
   1    LOC               LOC               1       S             1    A      4
   2    YR                YR                2       S             0    I      2
   3    MO                MO                2       S             0    I      2
   4    DY                DY                2       S             0    I      2
   5    STATUS            ST                2       S             0    A      6
   6    DEPTH             DP                2       S             0    F      9.4
   7    TEMP              TEMP              2       S             0    F      5.1
   8    PH                PH                2       S             0    F      4.1
   9    DO                DO                2       S             0    F      5.1
  10    SPC               SPC               2       S             0    F      6.1

 RP0808: NUMBER OF RECORDS IN TABLE=        10  LINES=      10
```

```
       DESCRIPTION FOR RAMIS FILE WTRUSAGE
                  02/01/83

                                                    LEVEL   SEGMENT
LIST    FIELDNAME         SYNONYM           LEVEL   TYPE    FACTOR     TYPE   LENGTH
----    ---------         -------           -----   -----   -------    ----   ------
   1    SHAFT             SH                1       S             1    A      3
   2    YEAR              YR                2       S             1    I      2
   3    MONTH             MO                2       S             1    I      2
   4    DAY               DY                2       S             1    I      2
   5    FLOW              FL                2       S             1    F      6.1

 RP0808: NUMBER OF RECORDS IN TABLE=         5  LINES=       5
```

TABLE 4.1-1 (Contd)

```
        DESCRIPTION FOR RAMIS FILE WTRQLT
                    02/02/83

                                                   LEVEL   SEGMENT
LIST   FIELDNAME       SYNONYM          LEVEL   TYPE    FACTOR    TYPE   LENGTH
----   ---------       -------          -----   -----   -------   ----   ------
   1   LOC             LOCATION         1       S         10      A      4
   2   YR              YEAR             2       S          1      I      2
   3   MO              MONTH            3       S          1      I      2
   4   DY              DAY              4       S          1      I      2
   5   TALK            TOTALK           4       S          1      F      7.1
   6   AL              ALUMINUM         4       S          1      F      6.3
   7   ARS             ARSENIC          4       S          1      F      5.3
   8   FCOLIF          FCOLIF           4       S          1      F      7.2
   9   BA              BARIUM           4       S          1      F      5.2
  10   HCO3            BICARBONTE       4       S          1      F      7.1
  11   BOD             BOD              4       S          1      F      6.1
  12   B               BORON            4       S          1      F      6.2
  13   BR              BROMIDE          4       S          1      F      6.3
  14   TCOLIF          TCOLIF           4       S          1      F      7.1
  15   CD              CADIUM           4       S          1      F      6.3
  16   CA              CALCIUM          4       S          1      F      6.1
  17   CO3             CARBONATE        4       S          1      F      6.1
  18   CL              CHLORIDE         4       S          1      F      7.1
  19   CR              CHROMIUM         4       S          1      F      6.3
  20   COD             COD              4       S          1      F      7.1
  21   CU              COPPER           4       S          1      F      6.3
  22   DO              DISSOXY          4       S          1      F      4.1
  23   DOC             DOC              4       S          1      F      5.1
  24   LAS             LASSURF          4       S          1      F      6.2
  25   F               FLORIDE          4       S          1      F      6.2
  26   HARD            HARDNESS         4       S          1      F      7.1
  27   FE              IRON             4       S          1      F      5.2
  28   KJN             KJELDNIT         4       S          1      F      5.2
  29   PB              LEAD             4       S          1      F      6.3
  30   LI              LITHIUM          4       S          1      F      5.2
  31   MG              MAGNESIUM        4       S          1      F      5.1
  32   MN              MANGANESE        4       S          1      F      6.3
  33   HG              MERCURY          4       S          1      D      8.5
  34   MOLY            MOLYBDENUM       4       S          1      F      6.3
  35   NI              NICKEL           4       S          1      F      6.3
  36   NO3             NITRATE          4       S          1      F      7.2
  37   OLGR            OILGREASE        4       S          1      F      5.1
  38   S203            S203             4       S          1      F      5.1
  39   PH              PH               4       S          1      F      4.1
  40   K               POTASSIUM        4       S          1      F      5.1
  41   RA              ALPHA            4       S          1      F      5.1
  42   BTR             BETA             4       S          1      F      5.1
  43   RR              RADIUM226        4       S          1      F      5.1
  44   SE              SELENIUM         4       S          1      F      6.3
  45   AG              SILVER           4       S          1      F      6.3
  46   NA              SODIUM           4       S          1      F      7.1
  47   TDS             TDS              4       S          1      F      7.1
  48   SOLS            SOLSOLIDS        4       S          1      F      7.1
```

TABLE 4.1-1 (Contd)

```
        DESCRIPTION FOR RAMIS FILE WTRQLT
                  02/02/83

                                                          LEVEL   SEGMENT
  LIST   FIELDNAME       SYNONYM          LEVEL   TYPE    FACTOR    TYPE   LENGTH
  ----   ---------       -------          -----   -----   -------   ----   ------
    49   SPC             SPECCOND         4       S             1   F      7.1
    50   SR              STRONTIUM        4       S             1   F      4.1
    51   SO4             SULFATE          4       S             1   F      6.1
    52   TEMP            TEMP             4       S             1   F      4.1
    53   ZN              ZINC             4       S             1   F      6.3
    54   TOC             TOC              4       S             1   F      5.1
    55   PHEN            PHENOLS          4       S             1   F      6.4
    56   CYAN            CYANIDE          4       S             1   F      6.3
    57   NH3             AMMONIA          4       S             1   D      8.3
    58   PST             PHOSPHATE        4       S             1   F      6.2
    59   SIO2            SILICA           4       S             1   F      6.1
    60   U               URANIUM          4       S             1   F      5.3
    61   SUSS            SUSSOLID         4       S             1   F      7.1
    62   TH              THORIUM          4       S             1   F      6.3
    63   CS              CESIUM           4       S             1   F      6.3
    64   I               IODINE           4       S             1   F      6.3
    65   SB              ANTIMONY         4       S             1   F      6.3
    66   ZR              ZIRCONIUM        4       S             1   F      6.3
    67   Y               YTTRIUM          4       S             1   F      5.3
    68   RB              RUBIDIUM         4       S             1   F      6.3
    69   GE              GERMAIUM         4       S             1   F      6.3
    70   GA              GALLIUM          4       S             1   F      6.3
    71   TI              TITANIUM         4       S             1   F      6.3
    72   SC              SCANDIUM         4       S             1   F      6.3
    73   W               TUNGSTEN         4       S             1   F      6.3
    74   CO              COBALT           4       S             1   F      6.3
    75   V               VANADIUM         4       S             1   F      6.3
    76   BE              BERRYLLIUM       4       S             1   F      5.3
    77   OH              HYDROXIDES       4       S             1   F      5.1
    78   CH              CONDHYDCARD      4       S             1   F      7.3
    79   PA              PALK             4       S             1   F      7.1
    80   MA              MOALK            4       S             1   F      7.1
    81   SCN             THIOCYANATE      4       S             1   F      6.2
    82   TURB            TURBIDITY        4       S             1   F      7.1
    83   FF              FLORIDE/FLD      4       S             1   F      7.1
    84   TSSF            TSS/FLD          4       S             1   F      7.1
    85   R228            RADIUM228        4       S             1   F      7.1

 RP0808: NUMBER OF RECORDS IN TABLE=        85   LINES=      85
```

TABLE 4.1-2

```
        DESCRIPTION FOR RAMIS FILE LTLAIR
                 02/01/83

                                                      LEVEL   SEGMENT
LIST    FIELDNAME       SYNONYM          LEVEL   TYPE    FACTOR    TYPE   LENGTH
----    ---------       -------          -----   -----   -------   ----   ------
   1    TRAILER         TRL              1       S             2   A      3
   2    YEAR            YR               2       S             0   A      2
   3    MONTH           MO               2       S             0   A      2
   4    DAY             DY               3       S            31   A      2
   5    HOUR            HR               3       S            31   A      2
   6    NITROGOX        NOX              3       S            31   F      6.1
   7    NITRICOX        NO               3       S            31   F      6.1
   8    SULFDIOX        SO2              3       S            31   F      6.1
   9    WINDSP30        WS               3       S            31   F      6.1
  10    WINDDIR30       WD               3       S            31   F      6.1
  11    RELATHUMID      RH               3       S            31   F      6.1
  12    TEMINTRL        TIN              3       S            31   F      6.1
  13    TEMOUT30        TOUT             3       S            31   F      6.1
  14    SOLRAD          SR               3       S            31   F      6.1
  15    HYDROGSULF      H2S              3       S            31   F      6.1
  16    LINEVOLT        VOLT             3       S            31   F      6.1
  17    TOTHYDCARB      THC              3       S            31   F      6.1
  18    METHANE         CH4              3       S            31   F      6.1
  19    CARBMONOX       CO               3       S            31   F      6.1
  20    OZONE           O3               3       S            31   F      6.1
  21    BARPRESS        PRES             3       S            31   F      6.1
  22    WINDSTDDEV      WSD              3       S            31   F      6.1
  23    RAINFALL        RAIN             3       S            31   F      6.1
  24    NITROGDIOX      NO2              3       S            31   F      6.1
  25    NONMETHHC       NMHC             3       S            31   F      6.1

RP0808: NUMBER OF RECORDS IN TABLE=      25   LINES=     25
```

Table 4.1-2 (Contd)

```
     DESCRIPTION FOR BASIC FILE METAIR
           02/17/83

                                                LEVEL  SEGMENT
LIST  FIELDNAME    SYNONYM           LEVEL     TYPE   FACTOR    TYPE  LENGTH
----  ----------   -------           -----     -----  -------   ----  ------
   1  TOWER        TOW               1         S         1      A     3
   2  YEAR         YR                2         S         0      A     2
   3  MONTH        MO                2         S         0      A     2
   4  DAY          DY                3         S        31      A     2
   5  HOUR         HR                3         S        31      A     2
   6  WINDSP8      WS1               3         S        31      F     6.1
   7  WINDDIR8     WD1               3         S        31      F     6.1
   8  RELHUM08     RH1               3         S        31      F     6.1
   9  TEMP8        TMP1              3         S        31      F     6.1
  10  WINDSP30     WS2               3         S        31      F     6.1
  11  WINDDIR30    WD2               3         S        31      F     6.1
  12  RELHUM30     RH2               3         S        31      F     6.1
  13  TEMP30       TMP2              3         S        31      F     6.1
  14  WINDSP100    WS3               3         S        31      F     6.1
  15  WINDDIR100   WD3               3         S        31      F     6.1
  16  RELHUM100    RH3               3         S        31      F     6.1
  17  TEMP100      TMP3              3         S        31      F     6.1
  18  WINDSP200    WS4               3         S        31      F     6.1
  19  WINDDIR200   WD4               3         S        31      F     6.1
  20  RELHUM200    RH4               3         S        31      F     6.1
  21  TEMP200      TMP4              3         S        31      F     6.1
  22  DELTTEMP1    DT1               3         S        31      F     6.1
  23  DELTTEMP2    DT2               3         S        31      F     6.1
  24  BIVWS30      BWS1              3         S        31      F     6.1
  25  HORWD30      HWD1              3         S        31      F     6.1
  26  VERTWD30     VWD1              3         S        31      F     6.1
  27  BIVWS100     BWS2              3         S        31      F     6.1
  28  HORWD100     HWD2              3         S        31      F     6.1
  29  VERTWD100    VWD2              3         S        31      F     6.1
  30  BIVWS200     BWS3              3         S        31      F     6.1
  31  HORWD200     HWD3              3         S        31      F     6.1
  32  VERTWD200    VWD3              3         S        31      F     6.1
  33  WINDSD8      WDV1              3         S        31      F     6.1
  34  WINDSD30     WDV2              3         S        31      F     6.1
  35  WINDSD100    WDV3              3         S        31      F     6.1
  36  WINDSD200    WDV4              3         S        31      F     6.1
  37  HWINDSD30    HSD1              3         S        31      F     6.1
  38  VWINDSD30    VSD1              3         S        31      F     6.1
  39  HWINDSD100   HSD2              3         S        31      F     6.1
  40  VWINDSD100   VSD2              3         S        31      F     6.1
  41  HWINDSD200   HSD3              3         S        31      F     6.1
  42  VWINDSD200   VSD3              3         S        31      F     6.1

RPOR08: NUMBER OF RECORDS IN TABLE=       42  LINES=     42
```

Table 4.1-2 (Contd)

```
      DESCRIPTION FOR RAMIS FILE MRIDATA
               02/01/83

                                                     LEVEL   SEGMENT
LIST    FIELDNAME        SYNONYM             LEVEL   TYPE    FACTOR    TYPE   LENGTH
----    ---------        -------             -----   -----   -------   ----   ------
   1    STATION          ST                  1       S             4   A      4
   2    YEAR             YR                  2       S             0   A      2
   3    MONTH            MO                  2       S             0   A      2
   4    DAY              DY                  3       S            31   A      2
   5    HOUR             HR                  3       S            31   A      2
   6    WINDSP           WS                  3       S            31   F      6.1
   7    WINDDR           WD                  3       S            31   F      6.1
   8    TEMP             TEMP                3       S            31   F      6.1
   9    SR/PR            SRPR                3       S            31   F      6.1

 RP0808: NUMBER OF RECORDS IN TABLE=         9   LINES=       9




      DESCRIPTION FOR RAMIS FILE PARTIC
               02/01/83

                                                     LEVEL   SEGMENT
LIST    FIELDNAME        SYNONYM             LEVEL   TYPE    FACTOR    TYPE   LENGTH
----    ---------        -------             -----   -----   -------   ----   ------
   1    TRAILER          TRL                 1       S             4   A      4
   2    YEAR             YR                  2       S             0   I      2
   3    MONTH            MO                  2       S             0   I      2
   4    DAY              DY                  3       S            31   I      2
   5    PARTICULATE      PART                3       S            31   F      6.1

 RP0808: NUMBER OF RECORDS IN TABLE=         5   LINES=       5




      DESCRIPTION FOR RAMIS FILE VRANGE
               02/01/83

                                                     LEVEL   SEGMENT
LIST    FIELDNAME        SYNONYM             LEVEL   TYPE    FACTOR    TYPE   LENGTH
----    ---------        -------             -----   -----   -------   ----   ------
   1    TRAILER          TRL                 1       S             1   A      4
   2    YEAR             YR                  2       S             0   I      2
   3    MONTH            MO                  2       S             0   I      2
   4    DAY              DY                  3       S             0   I      2
   5    RANGE            RNG                 3       S             0   F      6.1

 RP0808: NUMBER OF RECORDS IN TABLE=         5   LINES=       5
>
```

TABLE 4.1-3

```
        DESCRIPTION FOR RAMIS FILE DEERCNT
                  02/01/83

                                          L E V E L  SEGMENT
LIST   FIELDNAME        SYNONYM           NAME TYPE  FACTOR    FORMAT
----   ---------        -------           ---------  -------   ------
   1   MILE             ML                1     S        1     A    4
   2   YEAR             YR                2     S        1     I    2
   3   MONTH            MO                2     S        1     I    2
   4   DAY              DY                2     S        1     I    2
   5   WEATHER          WTHR              2     S        1     A   20
   6   COUNT            CNT               2     S        1     I    4
 RP0808: NUMBER OF RECORDS IN TABLE=          6  LINES=      6


      DESCRIPTION FOR RAMIS FILE DRKILL
                02/01/83

                                     L E V E L  SEGMENT
LIST   FIELDNAME      SYNONYM        NAME TYPE  FACTOR    FORMAT
----   ---------      -------        ---------  -------   ------
   1   MILE           ML             1     S       42     A    4
   2   YEAR           YR             2     S       10     I    2
   3   MONTH          MO             3     S       12     I    2
   4   DAY            DY             4     S       31     I    2
   5   STRESS         STR            5     S        1     A    5
   6   COUNT          CNT            5     S        1     I    4
   7   SEX            SX             6     S        1     A    2
   8   AGE            AG             6     S        1     A   10
   9   WEATHER        WTHR           7     S        1     A   20
RP0808: NUMBER OF RECORDS IN TABLE=          9  LINES=      9


       DESCRIPTION FOR RAMIS FILE MICRO
                 02/01/83

                                                LEVEL   SEGMENT
LIST   FIELDNAME       SYNONYM          LEVEL   TYPE    FACTOR    TYPE   LENGTH
----   ---------       -------          -----   -----   -------   ----   ------
   1   STATION         ST               1       S           2     A      4
   2   YEAR            YR               2       S           0     I      2
   3   MONTH           MO               3       S           0     I      2
   4   DAY             DY               4       S           0     I      2
   5   STATID          SID              5       S           0     A      2
   6   TEMPMAXIM       TPMX             5       S           0     F      5.1
   7   TEMPMINIM       TPMN             5       S           0     F      5.1
   8   SRFTPMAX        STPMX            5       S           0     F      5.1
   9   SRFTPMIN        STPMN            5       S           0     F      5.1
  10   PRECIP          PR               5       S           0     F      5.2
  11   SNODPTH         SD               5       S           0     F      5.1
  12   SNOMOIST        SM               5       S           0     F      5.1
 RP0808: NUMBER OF RECORDS IN TABLE=         12  LINES=      12


       DESCRIPTION FOR RAMIS FILE TRAF
                 02/01/83

                                          L E V E L  SEGMENT
LIST   FIELDNAME       SYNONYM            NAME TYPE  FACTOR    FORMAT
----   ---------       -------            ---------  -------   ------
   1   LOCATION        LOC                1     S        3     A    4
   2   YEAR            YR                 2     S        0     I    2
   3   MONTH           MO                 2     S        0     I    2
   4   DAY             DY                 2     S        0     I    2
   5   HOUR            HR                 3     S        0     I    2
   6   INTRAF          IT                 3     S        0     I    5
   7   OUTRAF          OT                 3     S        0     I    5
 RP0808: NUMBER OF RECORDS IN TABLE=          7  LINES=      7
```

TABLE 4.1-4

```
          DESCRIPTION FOR RAMIS FILE ACRADAR
                   02/01/83

                                                       LEVEL    SEGMENT
LIST    FIELDNAME         SYNONYM              LEVEL   TYPE     FACTOR     TYPE   LENGTH
----    ---------         -------              -----   -----    -------    ----   ------
   1    TRAILER           TRL                  1       S              1    A      4
   2    YEAR              YR                   2       S              0    A      2
   3    MONTH             MO                   2       S              0    A      2
   4    DAY               DY                   3       S             31    A      2
   5    HOUR              HR                   3       S             31    A      2
   6    MIXHGT            MIX                  3       S             31    F      6.1
   7    STBCLS1           ST31                 3       S             31    F      6.1
   8    INVERHGT          INV                  3       S             31    F      6.1
   9    STBCLS2           ST32                 3       S             31    F      6.1
 RP0808: NUMBER OF RECORDS IN TABLE=          9   LINES=        9
```

```
          DESCRIPTION FOR RAMIS FILE STLAIR
                   02/01/83

                                                       LEVEL    SEGMENT
LIST    FIELDNAME         SYNONYM              LEVEL   TYPE     FACTOR     TYPE   LENGTH
----    ---------         -------              -----   -----    -------    ----   ------
   1    TRAILER           TRL                  1       S              3    A      3
   2    YEAR              YR                   2       S              0    A      2
   3    MONTH             MO                   2       S              0    A      2
   4    DAY               DY                   3       S             31    A      2
   5    HOUR              HR                   3       S             31    A      2
   6    SULFDIOX          SO2                  3       S             31    F      6.1
   7    WINDSP30          WS                   3       S             31    F      6.1
   8    WINDDIR30         WD                   3       S             31    F      6.1
   9    RELATHUMID        RH                   3       S             31    F      6.1
  10    TEMINTRL          TIN                  3       S             31    F      6.1
  11    TEMOUT30          TOUT                 3       S             31    F      6.1
  12    HYDROGSULF        H2S                  3       S             31    F      6.1
  13    LINEVOLT          VOLT                 3       S             31    F      6.1
  14    BARPRESS          PRES                 3       S             31    F      6.1
  15    WINDSTDDEV        WSD                  3       S             31    F      6.1
  16    RAINFALL          RAIN                 3       S             31    F      6.1
 RP0808: NUMBER OF RECORDS IN TABLE=         16   LINES=       16
```

```
          DESCRIPTION FOR RAMIS FILE PIBAL
                   02/01/83

                                             L E V E L     SEGMENT
LIST    FIELDNAME         SYNONYM            NAME TYPE     FACTOR     FORMAT
----    ---------         -------            ---------     -------    ------
   1    YR                YEAR               1    S              1    I    2
   2    MO                MONTH              1    S              1    I    2
   3    DY                DAY                1    S              1    I    2
   4    TM                TIME               1    S              1    A    2
   5    HT                HEIGHT             1    S              1    I    5
   6    DIR               DIRECTION          1    S              1    I    4
   7    SP                SPEED              1    S              1    F    5.1
   8    TMP               TEMP               1    S              1    F    5.1
 RP0808: NUMBER OF RECORDS IN TABLE=          8   LINES=        8
```

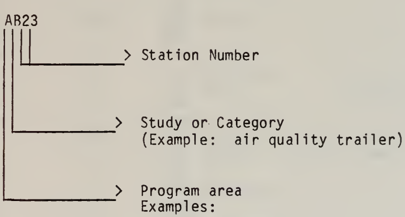
Table 4.1-4 (Contd)

```
        DESCRIPTION FOR RAMIS FILE EVAPORATION
                 02/01/83

                                                         LEVEL    SEGMENT
 LIST    FIELDNAME        SYNONYM            LEVEL      TYPE     FACTOR     TYPE   LENGTH
 ----    ---------        -------            -----      -----    -------    ----   ------
    1    TRL              TRAILER              1          S          1        A      4
    2    YR               YEAR                 1          S          1        I      2
    3    MO               MONTH                1          S          1        I      2
    4    DY               DAY                  1          S          1        I      2
    5    EVPAV            EVPAVER              1          S          1        F      7.3
    6    EVPTOT           EVPTOTAL             1          S          1        F      7.3
    7    WAV              WINDAVER             1          S          1        F      6.1
    8    WTOT             WINDTOTAL            1          S          1        F      6.1
 RP0808: NUMBER OF RECORDS IN TABLE=          8  LINES=        8


        DESCRIPTION FOR RAMIS FILE INJECTR
                 02/01/83

                                                         LEVEL    SEGMENT
 LIST    FIELDNAME        SYNONYM            LEVEL      TYPE     FACTOR     TYPE   LENGTH
 ----    ---------        -------            -----      -----    -------    ----   ------
    1    LOC     .        LOC                  1          S          1        A      4
    2    YR               YR                   2          S          0        I      2
    3    MO               MO                   2          S          0        I      2
    4    DY               DY                   2          S          0        I      2
    5    HR               HR                   2          S          0        I      2
    6    MN               MN                   2          S          0        I      2
    7    LEV              LEV                  2          S          0        F      7.2
 RP0808: NUMBER OF RECORDS IN TABLE=          7  LINES=        7


        DESCRIPTION FOR RAMIS FILE BIRDS
                 02/01/83

                                           L E V E L    SEGMENT
 LIST    FIELDNAME        SYNONYM          NAME  TYPE    FACTOR      FORMAT
 ----    ---------        -------          ----------    -------     ------
    1    TRANSECT         TRAN              1     S          1        I   2
    2    YEAR             YR                2     S          1        I   2
    3    GROUPNO          GN                2     S          1        I   2
    4    SPEICES          SP                2     S          1        A   5
    5    COUNT            CNT               2     S          1        I   4
 RP0808: NUMBER OF RECORDS IN TABLE=          5  LINES=        5
```

STATION COMPUTER
CODE

4.2 Station Computer Code

Four-digit computer codes have been designated for monitoring stations to be used with a computerized data base management system (RAMIS). A major portion of the raw data collected at the C-b Tract is retained in RAMIS. Once entered the data can be retrieved for reporting and/or statistical analysis. The codes reduce storage space and provide a systematic identification to access station data sets. The code consists of two letters followed by two numbers.



A = air
N = noise
W = water
B = biology
P = photography

The codes are presented in Table 4.2-1 for the environmental program along with the current station designations. This list contains codes for all the sampling/monitoring stations ever designated for environmental data collection. An attempt has been made throughout this report to refer to all stations in terms of their four-digit codes.

Table 4.2-1
COMPUTER CODE AND STATION I.D. CROSS-REFERENCE

I Air Quality & Meteorology

	Station Designation	Computer Code
Met. Tower:	@ Sta. 023	AA23
Trailers:	020	AB20
	021	AB21
	022	AB22
	023	AB23
	024	AB24
Acoustic Radar	Sta. 020	AC20
	021	AC21
	023	AC23
MRI and Particulates	Sta. 020	AD20
	031	AD31
	032	AD32
	033	AD33
	041	AD41
	042	AD42
	043	AD43
	044	AD44
	056	AD56
Visibility	View I	AV01
	View II	AV02
	View III	AV03
	View IV	AV04

II Biology

Deer Pellet Group Densities

Vegetation Type	Location	Treatment	Transect (Computer Code)
CPJ	Off Tract	Control	BA01
			BA02
			BA03
			BA04
			BA05
			BA06
			BA07
			BA08
			BA09
	On Tract		BA17
			BA18
			BA25
			BA28
			BA29
			BA30
			BA31

Biology (Cont'd)

Vegetation Type	Location	Treatment	Transect (Computer Code)
CPJ	On Tract	Development	BA32
		Sprinkler	BA20
		Development	BA21
			BA23
PJ	Off Tract	Control	BA13
			BA14
			BA15
		Development	BA10
			BA11
			BA12
			BA16
	On Tract	Control	BA19
			BA26
			BA27
		Development	BA22
			BA24
Brush Beaten* SB	Off Tract	Development	BA41
			BA42
			BA43
			BA44
			BA45
			BA46
			BA47
			BA48
			BA49

Biology (Cont'd)

Programs: Deer Distribution & Migration and Road Kills

Mile Marker	Location	Computer Code	
		North & East of Piceance Creek Road	Meadows; South & West of Piceance Creek Road
41	White River City	BN41	BM41
40	Piceance Bridge	BN40	BM40
39	Lower Canyon	BN39	BM39
38	Piceance Canyon	BN38	BM38
37	Yellow Creek	BN37	BM37
36	Stinking Springs	BN36	BM36
35	Old Bridge	BN35	BM35
34	Little Hills Turnoff	BN34	BM34
33	Old Corrals & Buildings	BN33	BM33
32	Burk Ranch	BN32	BM32
31	Ranch	BN31	BM31
30		BN30	BM30
29		BN29	BM29
28	Bureau of Mines	BN28	BM28
27	Ryan Gulch	BN27	BM27
26	Pump Station	BN26	BM26
25		BN25	BM25
24	Rock School	BN24	BM24
23	AQ 021	BN23	BM23
22	Pat Johnson's Ranch	BN22	BM22
21	Hunter Creek	BN21	BM21
20	PL Gate	BN20	BM20
19	AQ 020	BN19	BM19
18	Sorghum, Cottonwood	BN18	BM18
17	Stewart Gulch Rd.	BN17	BM17
16	AQ Trailer 022	BN16	BM16
15	Oldland's Ranch	BN15	BM15
14	Oldland's Ranch	BN14	BM14
13	Pond and Cabin	BN13	BM13
12	Sprague Gulch	BN12	BM12
11	Cascade Gulch	BN11	BM11
10	13 Mile Gulch	BN10	BM10
9	14 Mile Gulch	BN09	BM09
8	Schutte Gulch	BN08	BM08
7	Robinson's Ranch	BN07	BM07
6		BN06	BM06
5	2 Old Cabins (35 MPH Curve)	BN05	BM05
4	McCarthy Gulch	BN04	BM04
3	Cow Creek	BN03	BM03
2	Mahogany Outcropping	BN02	BM02
1	Woodward Ranch	BN01	BM01
0	Rio Blanco Store	BN00	BM00

Biology (Cont'd)

Programs	General Location		Computer Code
Deer Mortality	North Side of Piceance Creek		BD01 BD02 BD03 BD04 BD05 BD06
	South Side of Piceance Creek		BD07 BD08 BD09 BD10
Deer Age Class	General Area of Tract		BF01
Coyote Abundance	8 Transects for Total for 30 miles		BF01
	15 mi seg. near Hunter (Control)		BF02 thru BF08
	15 mi seg. on & South of Tract (Development)		
Lagomorph Abundance	Identical Locations to Deer Pellet Group Densities		BA01 to BA49
Small Mammals	Piceance Creek (Development)		BG01
	On-Tract-West		BG02
	Piceance Creek (Control)		BG03
	On-Tract-East		BG04
	Sprinkler Area Section B		BG05
	Sprinkler Area (Control)		BG11
	Sprinkler Area (Development		BG22
	Sprinkler Area (Control)		BG33
Avifauna			
Songbirds and Gamebirds	N.W. of Tract-near Jimmy	PJ-CH-C	BH01
	On-Tract-Scandard	PJ- -D	BH02
	On-Tract-Cottonwood	PJ-CH-D	BH03
	S. of Tract-Between W&N Fork Stewart	PJ-CH-C	BH04
	Sprinkler		BH05
Raptors	The Entire Tract and Surrounding Study Areas.		BI01
Aquatic Ecology			
Benthos	USGS 09306007 (Control)		WU07
	USGS 09306058 (Development)		WU58
	USGS 09306061 (Development)		WU61
Periphyton	Piceance Creek Upstream (Control)		WP01 WP02
	Piceance Creek Downstream (Development)		WP03

Biology (Cont'd)

Programs	General Location	Computer Code		
Water Quality	USGS 09306061 (Development)	WU61		
Vegetation Community Structure	Plots	*	**	***
	Chained pinyon juniper (1978)(Dev)	BJ01	BJ11	BJ21
	Chained pinyon juniper (1978)(Cont)	BJ02	BJ12	BJ22
	Upland sagebrush (1980)(Cont)	BJ03	BJ13	BJ23
	Bottomland sagebrush (1980)(Cont)	BJ04	BJ14	BJ24
	Pinyon juniper woodland (1979)(Dev)	BJ05	BJ15	BJ25
	Pinyon juniper woodland (1979)(Cont)	BJ06	BJ16	BJ26

Biology (Cont'd)

Program	General Location	Computer Code
Micro Climate	MC Sta. 1	BC01
	2	BC02
	3	BC03
	4	BC04
	5	BC05
	6	BC06
	7	BC07
	8	BC08
	9	BC09
	13	BC13
Traffic Count	Rio Blanco Store	BT01
	South of Cattle Guard	BT02
	Rio Blanco Lake	BT03

III Noise

	Station Designation	Computer Code
Traffic Noise	Sta.	
	IX	NB01
	XV	NB15

IV Photography

P1	PA01
P2	PA02
P3	PA03
P4	PA04
P5	PA05
P6	PA06
P7	PA07
P8	PA08
P9	PA09
P10	PA10
P11	PA11
P12	PA12
P13	PA13
P14	PA14
P15	PA15
P16	PA16
P17	PA17
P18	PA18
P19	PA19
P20	PA20
P21	PA21
P22	PA22
P23	PA23
P24	PA24
P25	PA25

Photography

Program	General Location	Computer Code
Photography	P26	PA26
	P27	PA27
	P28	PA28
	P29	PA29
	P30	PA30
	P31	PA31
	P32	PA32
	P33	PA33
	P34	PA34
	P35	PA35

V. Water

Program	Station Designation	Computer Code	Elevation(ft)
U.S.G.S. Stream Gauging Station	09304800	WU48	
	09306007	WU07	
	09306036	WU36	
	09306039	WU39	
	09306042	WU42	
	09306061	WU61	
	09306050	WU50	
	09306052	WU52	
	09306058	WU58	
	09306033	WU33	
	09306025	WU25	
	09306015	WU15	
	09306028	WU28	
	09306022	WU22	
	09306200	WU00	
	09306222	WU62	
	09306255	WU55	
Alluvial Wells	A-1	WA01	6282.2
	A-2	WA02	6284.5
	A-3	WA03	6448.6
	A-4	WA04	0000.0
	A-5	WA05	6345.0
	A-5A	WA55	6460.0
	A-5B	WA56	0000.0
	A-6	WA06	6360.0
	A-7	WA07	6383.8
	A-8	WA08	6409.0
	A-9	WA09	6540.2
	A-10	WA10	6610.6
	A-11	WA11	6503.8
	A-12	WA12	6691.8
	A-13	WA13	0000.0
Springs and Seeps	CB S-1	WS01	
	CB S-2	WS02	
	CB S-3	WS03	
	CB S-4	WS04	
	CB S-6	WS06	
	CB S-6A	WS66	
	CB S-7	WS07	
	CB S-8	WS08	
	CB S-9	WS09	
	CB S-10 (W-3)	WS10 (WS34)	
	CB Seep A	WS11	
	S-102	WS12	
	CER-1	WS21	
	B-3	WS22	
	H-3	WS23	
	F-3	WS24	

V. Water

Program	Station Designation	Computer Code	Elevation(ft)
Springs and Seeps (cont)	Figure 4-A	WS25	
	W-4	WS26	
	W-9	WS27	
	CER-7	WS28	
	S-9	WS29	
	P3 & P3A	WS30	
	CER-6	WS31	
	W-2 (S-9)	WS32	
	S-2	WW33	
	W-3 (CB S-10)	WS34 (WS10)	
	Figure 4	WS35	
	S-11 (S-101)	WS36	
	Oldland Spring	WS37	
Precipitation	CB-020	AB20	
	CB-023	AB23	
	LH	WR01	
	M	WR02	
	SG	WR03	
	CG	WR04	
	JOS	WR05	
	EFPC	WR06	
	EMFPC	WR07	
	UCBW	WR08	

V. Water (cont'd)
Upper Aquifer Wells

Before Recompletions			Recompletion #1			Recompletion #2		
Station	Code	Elevation(ft)	Station	Code	Date	Station	Code	Date
CB-2	WX02	6737.0	CB-2	WD02	11-18-80			
CB-4	WX04	7057.3	CB-4	WE04	11-20-80			
SG-10A	WX10	6953.6	SG-10A-1	WE10	*	SG-10A-1	WG51	
			SG-10A-2	WD10	*	SG-10A-2	WE51	*
						SG-10A-Annulus	WD51	
SG-1A	WX11	6425.0	SG-1A-1	WE11	12-12-80			
			SG-1A-2	WD11	12-12-80			
SG-1-2	WX12	6428.6	SG-1 -2	WD12	11-01-80			
14X-7	WX14	6909.0	14X-7-1	WD14	11-15-80			
			14X-7-2	WD15	11-15-80			
SG-17-2	WX17	7038.6				SG-17-2	WE17	11-03-80
						SG-17-3	WD17	11-03-80
						SG-17-4	WC17	11-03-80
SG-18A	WX18	7386.6	SG-18A-1	WG18	12-02-80			
			SG-18A-2	WE18	12-01-80			
			SG-18A-3	WD18	12-02-80			
SG-19	WX19	6384.4	SG-19	WD19				
SG-20	WX20	6358.0	SG-20-1	WG20	11-15-80			
			SG-20-2	WE20	11-15-80			
			SG-20-3	WD20	11-15-80			
SG-21	WX21	6813.3	SG-21-1	WH21	12-08-80			
			SG-21-2	WG21	12-08-80			
			SG-21-3	WE21	12-08-80			
			SG-21-4	WD21	12-09-80			
AT-1C-3	WX44	6906.0						
SG-11-3	WX55	6903.1				SG-11-3	WD52	10-18-80
SG-6-3	WX63	6890.7	SG-6-3	WD61	10-20-80			
SG-8-2	WX82	0000.0						
SG-9-2	WX92	6873.0	SG-9-2	WE91	12-11-80			
			SG-9-3	WD91	12-11-80			
			SG-9-4	WC91	12-12-80			
32X-12	WX32	6830.3						
33X-1	WX33	6707.1						
41X-1	WX41	6460.0						
TH75-5A	WX64	7178.0						
TH75-13A	WX65	6390.0						
TH75-18A	WX67	6740.0						
TH75-9A	WX69	7350.0						
CER RB-D-02	WX71	6580.0						
TH75-15A	WX72	6805.0						
UNION 8-1	WX73	8142.3						
COLONY 12-596	WX74	0000.0						
TH-5	WX75	7583.2						

* Recompletion #1 not satisfactory for these strings: use #2.

V. Water (cont'd)

Lower Aquifer Wells

Before Completion			Recompletion #1			Recompletion #2		
Station	Code	Elevation'	Station	Code	Date	Station	Code	Date
CB-1	WY01	6763.4	CB-1	WD01	11-14-80			
CB-3	WY03	6743.1	CB-3	WE03	11-18-80			
SG-10	WY09	6952.5	SG-10R	WG10		SG-10	WD90	
SG-1-1	WY12	6428.8	SG-1-1	WG12	11-1-80			
SG-17-1	WY18	7038.6	SG-17-1R	WY17		SG-17-1	WG17	11-03-80
AT-1C-1	WY45	6906.0						
AT-1C-2	WY46	6906.0						
SG-11-1	WY51	6903.1	SG-11-1R	WY52		SG-11-1	WG52	10-18-80
SG-11-2	WY54	6903.1				SG-11-2	WE52	10-18-80
SG-6-1	WY61	6890.7	SG-6-1	WE61	10-20-80			
SG-6-2	WY62	6890.7	SG-6-2	WG61	10-20-80			
SG-8	WY80	6540.8	SG-8R	WY81				
SG-9-1	WY91	6873.0	SG-9-1	WG91	12-11-80			
AT-1	WY44	6909.0						
TH75-5B	WY64	7178.0						
TH75-13B	WY65	6390.0						
EQUITY-1	WY66	6286.0						
TH75-10B	WY68	6840.0						
TH75-9B	WY69	7350.0						
EQUITY-S-1A	WY70	7070.0						
CER RB-D-03	WY71	6580.0						
TH75-15B	WY72	6805.0						
TG71-3	WY75	6820.0						
TG71-5	WY76	6865.0						
GETTY 9-40	WY77	7777.8						
TG71-4	WY78	7145.0						
EQUITY BS-13	WY79	7020.0						

New Wells

Station	Code	Date	Elevation (ft)
SG-17A	WD57	12-02-80	7036.0
AT-1D-1	WG41	11-16-80	6909.0
AT-1D-2	WE41		
AT-1D-3	WD41	11-16-80	6909.0
AT-1A	WV37		6909.0
AT-1A1	WX38		6909.0
AT-1B	WV40		6909.0

V. Water (cont'd)

	Before Recompletions			Recompletion #1		
	Station	Code	Elevation'	Station	Code	Date
Composite Wells:						
	GREENO 404	WV01	6411.0			
	OLDLAND 3	WV02	6490.0			
	GP-17X-BG	WV03				
	BUTE 25	WV04				
	LIBERTY BELL 12	WV05	7420.0			
	TOSCO WELL	WV06				
	21X12	WV07	6794.8			
	22X1	WV08	6704.1			
	43X2	WV09	6692.7			
Seepage Monitoring Wells:						
	32Y-12	WW32				
	31X-12	WW12	6764.	31X12	WW22	11/80
	41X-13-2	WW13	6953.6			
Reinjection Wells:	22X-17	WI19				
	11X-18	WI18	6950.0			
	24X-17	WI17				
Le Claire Filter:	BEFORE FILTER	W001				
	AFER FILTER	W002				
	AT REINJECTION POINT	W003				
Ponds:						
	POND A	WN01				
	POND B	WN02				
	POND C	WN03				
	POND A SPRINGS	WN11				
	POND B SPRINGS	WN12				
	POND C SPRINGS	WN13				
	POND A INLET	WN21				
	POND B INLET	WN22				
	POND C INLET	WN23				
	POND A-B CROSSOVER	WN31				
	POND B OUTLET	WN32				
	POND C OUTLET	WN33				
	BACKWASH POND	WN04				
	BACKWASH POND SPRINGS	WN14				
	BACKWASH POND INLET	WN24				
	BACKWASH POND OUTLET	WN34				
	POND A-B DISCHARGE	WN40				
Shafts:						
	V/E SHAFT PROBE HOLES	WZ01				
	SERVICE SHAFT PROBE HOLES	WZ02				
	PRODUCTION SHAFT PROBE HOLES	WZ03				
	V/E SHAFT WATER RING	WZ11				
	SERVICE SHAFT WATER RING	WZ12				
	PRODUCTION SHAFT WATER RING	WZ13				

V. Water (cont'd)

	Before Recompletions			Recompletion #1		
	Station	Code	Elevation'	Station	Code	Date
	V/E SHAFT SUMP	WZ21				
	SERVICE SHAFT SUMP	WZ22				
	PRODUCTION SHAFT SUMP	WZ23				
	V/E SHAFT	WZ31				
	PRODUCTION SHAFT	WZ33				
	SHAFT GROUT HOLE	WZ41				
Discharge Monitoring Stations						
	NO NAME GULCH	WU42				
	UPPER PICEANCE CREEK	WN41				
	LOWER PICEANCE CREEK	WN42				
	HUNTER CREEK	WU02				
	WILLOW CREEK	WU01				
Mobil Wells	WELL NO. 1	MW01	6510			
	WELL NO. 2	MW03	6480			
	WELL NO. 3	MW03	6618			
	WELL NO. 12	MW12	6486			
	WELL NO. 13	MW13	6509			

4.3 Station Coordinates

Environmental monitoring stations have been specified by station computer code, latitude and longitude, township and range, Colorado State coordinates and elevations. In cases where stations represent biological transects several meters in length, the coordinates reported are those of a point on the map near the station label. A jacket map of the Tract area (Figure 4.3-1) showing all monitoring stations on and near Tract C-b, required by the Interim Monitoring Program, and a jacket map (Vol. I, Figure 2.2-1) of off tract monitoring stations, required by Water Augmentation Plan, contain the four-digit computer station codes.

ENVIRONMENTAL DATA COLLECTION STATION COORDINATES

STATION CODE	LATITUDE & LONGITUDE	TOWNSHIP & RANGE	STATE COORDINATES*	ELEVATION
I. AIR QUALITY AND METEOROLOGY				
AA23	39° 47' 43" 108° 12' 57"	T3S R96W Sec 18 NW1/4, NW1/4, NW1/4	N 180,000 E 1,237,045	6950'
AB20	39° 50' 10" 108° 13' 08"	T2S R97W Sec 36 NE1/4, SE1/4, NE1/4	N 194,845 E 1,236,605	6280'
*AB23	39° 47' 44"* 108° 12' 54"	T3S R96W Sec 18 NE1/4, NW1/4, NW1/4	N 180,000 E 1,237,234	6950'
AB24 *	39° 48' 49" 108° 12' 21"	T3S R96W Sec 6 NE1/4, SW1/4, SE1/4	N 186,542 E 1,240,000	6750'
AB26			N 166,900 E 1,235,200	
AC20	39° 50' 08" 108° 13' 06"	T2S R97W Sec 36 NE1/4, SE1/4, NE1/4	N 194,594 E 1,236,794	6310'
AD42	39° 48' 58" 108° 13' 08"	T3S R97W Sec 1 SE1/4, NE1/4, SE1/4	N 187,548 E 1,236,417	6720'
AD56* *	39° 49' 31" 108° 12' 23"*	T3S R96W Sec 6 NE1/4, NW1/4, NE1/4	N 190,760 E 1,240,005	6380'
II. BIOLOGY				
*BA01 *	39° 50' 15"* 108° 16' 12"*	T2S R97W Sec 34 SW1/4, NE1/4, NW1/4	N 195,788 E 1,222,268	6480'
*BA02 *	39° 50' 3"* 108° 16' 4"*	T2S R97W Sec 34 SE1/4, SW1/4, NW/14	N 194,594 E 1,222,079	6500'
BA03	39° 49' 32" 108° 16' 5"	T3S R97W Sec 3 NE1/4, NE1/4, NW1/4	N 191,388 E 1,222,708	6640'
BA04	39° 49' 12" 108° 15' 46"	T3S R97W Sec 3 NE1/4, NW1/4, SE1/4	N 189,371 E 1,224,091	6600'
BA05	39° 48' 39" 108° 16' 14"	T3S R97W Sec 3 SW1/4, SE1/4, SW1/4	N 186,039 E 1,221,828	6720'
BA06	39° 48' 19" 108° 16' 19"	T3S R97W Sec 10 SE1/4, SW1/4, NW1/4	N 184,028 E 1,221,388	6780'
BA07	39° 47' 49" 108° 16' 28"	T3S R97W Sec 10 NW1/4, SW1/4, SW1/4	N 181,074 E 1,220,571	6860'

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* *Plane Coordinate Projection Tables, Colorado*, Special Publication No. 276, U.S. Government Printing Office.

ENVIRONMENTAL DATA COLLECTION STATION COORDINATES

STATION CODE	LATITUDE & LONGITUDE	TOWNSHIP & RANGE	STATE COORDINATES*	ELEVATION
BA08	39° 47' 33" 108° 16' 38"	T3S R97W Sec 16 NE1/4, SE1/4, NE1/4	N 179,497 E 1,218,748	6860'
BA09	39° 47' 9" 108° 16' 49"	T3S R97W Sec 16 SE1/4, NW1/4, SE1/4	N 177,108 E 1,218,805	6940'
BA10	39° 50' 48" 108° 14' 20"	T2S R97W Sec 25 SW1/4, SW1/4, NW1/4	N 198,868 E 1,231,137	6600'
BA11	39° 50' 46" 108° 13' 42"	T2S R97W Sec 25 SE1/4, NE1/4, SW1/4	N 198,554 E 1,234,091	6580'
BA12	39° 50' 29" 108° 13' 8"	T2S R97W Sec 25 SE1/4, SE1/4, SE1/4	N 196,731 E 1,236,668	6600'
BA13	39° 49' 52" 108° 12' 5"	T2S R96W Sec 31 SE1/4, NE1/4, SE1/4	N 192,834 E 1,241,451	6600'
BA14	39° 49' 52" 108° 10' 55"	T2S R96W Sec 33 SW1/4, NW1/4, SW1/4	N 192,645 E 1,246,920	6700'
BA15	39° 49' 46" 108° 10' 30"	T2S R96W Sec 33 NW1/4, SE1/4, SW1/4	N 192,079 E 1,248,868	6600'
BA16	39° 49' 56" 108° 14' 9"	T2S R97W Sec 36 NW1/4, NW1/4, SW1/4	N 193,525 E 1,231,828	6500'
BA17	39° 48' 32" 108° 14' 38"	T3S R97W Sec 11 SW1/4, NW1/4, NE1/4	N 185,097 E 1,229,308	6680'
BA18	39° 47' 49" 108° 14' 25"	T3S R97W Sec 14 NW1/4, NE1/4, NE1/4	N 180,760 E 1,230,131	6820'
BA19	39° 47' 56" 108° 14' 2"	T3S R97W Sec 12 NE1/4, SW1/4, SW1/4	N 181,451 E 1,232,017	6680'
BA20	39° 48' 0" 108° 12' 32"	T3S R96W Sec 7 SE1/4, SE1/4, NW1/4	N 182,142 E 1,238,554	6860'
BA21	39° 4' 6" 108° 12' 33"	T3S R96W Sec 7 NE1/4, SE1/4, SW1/4	N 181,640 E 1,239,057	6820'
BA22	39° 47' 4" 108° 12' 5"	T3S R96W Sec 18 SE1/4, NE1/4, SW1/4	N 176,165 E 1,238,742	6860'
BA23	39° 48' 51" 108° 12'	T3S R96W Sec 7 NE1/4, SE1/4, SE1/4	N 181,954 E 1,241,137	6840'

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ENVIRONMENTAL DATA COLLECTION STATION COORDINATES

STATION CODE	LATITUDE & LONGITUDE	TOWNSHIP & RANGE	STATE COORDINATES*	ELEVATION
BA24	39° 48' 51" 108° 11' 51"	T3S R96W Sec 5 NE1/4, SW1/4, SW1/4	N 186,668 E 1,242,398	6640'
BA25	39° 47' 16" 108° 11' 46"	T3S, R96W Sec 17 NW1/4, NE1/4, SW1/4	N 177,045 E 1,242,457	7000'
BA26	39° 48' 8" 108° 10' 52"	T3S, R96W Sec 9 NW1/4, NW1/4, SW1/4	N 182,142 E 1,246,857	6840'
BA27	39° 47' 4" 108° 11' 13"	T3S R96W Sec 16 NW1/4, SW1/4, SW1/4	N 175,725 E 1,245,034	7020'
BA28	39° 48' 28" 108° 14' 29"	T3S R97W Sec 11 SE1/4, NW1/4, NE1/4	N 184,657 E 1,230,000	6680'
BA29a	39° 47' 43" 108° 14' 16"	T3S R97W Sec 14 NE1/4, NE1/4, NE1/4	N 180,068 E 1,230,885	6860'
BA29b	39° 47' 38" 108° 14' 23"	T3S R97W Sec 14 SW1/4, NE1/4, NE1/4	N 179,622 E 1,230,320	6900'
BA30	39° 48' 49" 108° 12' 35"	T3S R96W Sec 6 NE1/4, SE1/4, SW1/4	N 186,542 E 1,238,931	6720'
BA31	39° 48' 23" 108° 12' 40"	T3S R96W Sec 7 NE1/4, SE1/4, NW1/4	N 183,965 E 1,238,491	6820'
BC01	39° 47' 56" 108° 11' 58"	T3S R97W Sec 8 NW1/4, SW1/4, SW1/4	N 181,137 E 1,241,640	6860'
BC02	39° 47' 48" 108° 14' 22"	T3S R97W Sec 11 SW1/4, SE1/4, SE1/4	N 180,634 E 1,230,382	6860'
BC03	39° 46' 57" 108° 12' 1"	T3S R96W Sec 17 SW1/4 SW1/4, SW1/4	N 175,097 E 1,241,262	7100'
BC04	39° 47' 28" 108° 13' 32"	T3S R97W Sec 13 NW1/4, SW1/4, NE1/4	N 178,491 E 1,234,217	6700'
BC05	39° 48' 3" 108° 11' 58"	T3S R96W Sec 8 SE1/4, NW1/4, SW1/4	N 181,765 E 1,241,702	6840'
BC06	39° 47' 54" 108° 10' 44"	T3S R96W Sec 9 SE1/4, SW1/4, SW1/4	N 180,697 E 1,247,422	6900'
BC07	39° 47' 44" 108° 13' 17"	T3S R97W Sec 13 NW1/4, NE1/4, NE1/4	N 180,068 E 1,235,474	6940'

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ENVIRONMENTAL DATA COLLECTION STATION COORDINATES

STATION CODE	LATITUDE & LONGITUDE	TOWNSHIP & RANGE	STATE COORDINATES*	ELEVATION
BC08	39° 50' 30" 108° 13' 36"	T2S R97W Sec 25 NW1/4, SW1/4, SW1/4	N 196,920 E 1,234,468	6350'
BC09	39° 49' 30" 108° 11' 53"	T3S R96W Sec 5 NE1/4, NW1/4, NW1/4	N 190,634 E 1,242,331	6400'
BC13	39° 47' 19" 108° 11' 20"	T3S R96W Sec 17 NE1/4, NW1/4, SE1/4	N 177,234 E 1,244,531	6700'
BD01	39° 50' 59" 108° 14' 26"	T2S R97W Sec 26 SE1/4, SE1/4, NE1/4	N 200,000 E 1,230,697	6380'
BD02	39° 50' 44" 108° 13' 55"	T2S R97W Sec 25 NW1/4, NE1/4, SW1/4	N 198,428 E 1,233,022	6370'
BD03	39° 50' 34" 108° 12' 57"	T2S R96W Sec 30 SW1/4, SW1/4, SW1/4	N 197,171 E 1,237,548	6420'
BD04	39° 50' 3" 108° 12' 19"	T2S R96W Sec 31 SW1/4, SE1/4, NE1/4	N 194,028 E 1,240,445	6420'
BD05	39° 50' 9" 108° 11' 41"	T2S R96W Sec 32 NW1/4, SE1/4,NW1/4	N 194,468 E 1,243,400	6420'
BD06	39° 49' 46" 108° 10' 34"	T2S R96W Sec 33 NW1/4, SE1/4, SW1/4	N 192,017 E 1,248,554	6500'
BD07	39° 49' 51" 108° 13' 16"	T2S R97W Sec 36 SW1/4, NE1/4, SE1/4	N 192,897 E 1,235,914	6380'
BD08	39° 49' 46" 108° 12' 43"	T2S R96W Sec 31 NW1/4, SE1/4, SW1/4	N 192,394 E 1,238,491	6360'
BD09	39° 49' 26" 108° 12' 28"	T3S R96W Sec 6 SW1/4, NW1/4, NE1/4	N 190,257 E 1,239,559	6410'
BD10	39° 49' 17" 108° 11' 49"	T3S R96W Sec 5 NE1/4, SW1/4, NW1/4	N 189,245 E 1,242,582	6420'

Coordinates Picked Near Transect Map Code Level

STATION CODE	LATITUDE & LONGITUDE	TOWNSHIP & RANGE	STATE COORDINATES*	ELEVATION
BF01	39° 47' 53" 108° 16' 35"	T3S R97W Sec 9 NE1/4, SE1/4, SE1/4	N 181,514 E 1,220,068	6900'
BF02	39° 48' 02" 108° 14' 27"	T3S R97W Sec 11 SW1/4, NE1/4, SE1/4	N 182,017 E 1,230,068	6800'
BF03	39° 46' 40" 108° 13' 32"	T3S R97W Sec 24 NW1/4, SW1/4, NE1/4	N 173,651 E 1,234,091	6860'

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ENVIRONMENTAL DATA COLLECTION STATION COORDINATES

STATION CODE	LATITUDE & LONGITUDE	TOWNSHIP & RANGE	STATE COORDINATES*	ELEVATION
BF04	39° 46' 25" 108° 13' 04"	T3S R97W Sec 24 NE1/4, NE1/4, SE1/4	N 172,017 E 1,236,228	7190'
BF05	39° 47' 30" 108° 12' 9"	T3S R96W Sec 18 NE1/4, SE1/4, NE1/4	N 178,491 E 1,240,697	6980'
BF06	39° 47' 44" 108° 11' 43"	T3S R96W Sec 17 NW1/4, NE1/4, NW1/4	N 179,874 E 1,242,771	6940'
BF07	39° 46' 09" 108° 11' 49"	T3S R96W Sec 20 SW1/4, SE1/4, SW1/4	N 170,257 E 1,242,017	6820'
BF08	39° 47' 31" 108° 11' 9"	T3S R96W Sec 16 NE1/4, SW1/4, NW1/4	N 178,491 E 1,245,411	6950'
BG01	39° 50' 17" 108° 13' 58"	T2S R97W Sec 36 SW1/4, NE1/4, NW1/4	N 195,662 E 1,232,708	6360'
BG02	39° 47' 46" 108° 13' 23"	T3S R97W Sec 13 NE1/4, NW1/4, NE1/4	N 180,320 E 1,234,971	6940'
BG03	39° 49' 39" 108° 12' 10"	T2S R96W Sec 31 SE1/4, SE1/4, SE1/4	N 191,577 E 1,241,011	6300'
BG04	39° 47' 40" 108° 10' 55"	T3S R96W Sec 16 SW1/4, NW1/4, NW1/4	N 179,371 E 1,246,542	6860'
BH01	39° 48' 46" 108° 15' 59"	T3S R97W Sec 5 SE1/4, SE1/4, SW1/4	N 186,731 E 1,223,022	6660'
BH02	39° 47' 59" 108° 13' 38"	T3S R97W Sec 12 SW1/4, SW1/4, SE1/4	N 181,640 E 1,233,902	6780'
BH03	39° 48' 14" 108° 13' 1"	T3S R96W Sec 7 SW1/4, NW1/4, SW1/4	N 183,085 E 1,236,794	6840'
BH04	39° 46' 48" 108° 10' 56"	T3S R96W Sec 20 NE1/4, SE1/4, NE1/4	N 174,091 E 1,246,291	7120'
BJ01	39° 47' 56" 108° 11' 58"	T3S R96W Sec 8 NW1/4, SW1/4, SW1/4	N 181,137 E 1,241,640	6860'
BJ02	39° 47' 43" 108° 14' 23"	T3S R97W Sec 14 NW1/4, NE1/4, NE1/4	N 180,194 E 1,230,320	6870'
BJ03	39° 46' 58" 108° 12' 3"	T3S R96W Sec 17 SW1/4, SW1/4, SW1/4	N 175,285 E 1,241,074	7100'

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ENVIRONMENTAL DATA COLLECTION STATION COORDINATES

STATION CODE	LATITUDE & LONGITUDE	TOWNSHIP & RANGE	STATE COORDINATES*	ELEVATION
BJ04	39° 47' 24" 108° 13' 30"	T3S R97W Sec 13 SE1/4, SW1/4, NE1/4	N 178,114 E 1,234,405	6700'
BJ05	39° 48' 08" 108° 11' 54"	T3S R96W Sec 8 SE1/4, NW1/4, SW1/4	N 182,268 E 1,242,017	6840'
BJ06	39° 47' 53" 108° 10' 42"	T3S R96W Sec 9 SE1/4, SW1/4, SW1/4	N 180,634 E 1,247,611	6880'
III. NOISE				
NA02	39° 50' 43" 108° 14' 19"	T2S R97W Sec 25 SW1/4, NW1/4, SW1/4	N 198,302 E 1,231,200	6520'
NA09	39° 49' 08" 108' 14' 17"	T3S R97W Sec 2 SE1/4, SE1/4, NE1/4	N 188,679 E 1,231,074	6660'
NA22	39° 50' 43" 108° 14' 19"	T2S R97W Sec 25 SW1/4, NW1/4, SW1/4	N 198,302 E 1,231,200	6520'
NB01		TS35 R96W Sec 1	N 187,422 E 1,234,405	
NB15	39° 49' 04" 108° 13' 26"	T3S R97W Sec 1 NE/14, NW1/4, SE1/4	N 188,177 E 1,234,971	6720'
IV. PHOTOGRAPHY				
PA01	39° 51' 50" 108° 11' 23"	T2S R96W Sec 20 SW1/4, SW1/4, NE1/4	N 204,714 E 1,245,097	7420'
PA02	39° 50' 44" 108° 14' 5"	T2S R97W Sec 25 SE1/4, NW1/4, SW1/4	N 198,365 E 1,232,268	6560'
PA03	39° 50' 23" 108° 14' 7"	T2S R97W Sec 36 NE1/4, NW1/4, NW1/4	N 196,291 E 1,232,079	6300'
PA04	39° 49' 58" 108° 13' 11"	T2S R97W Sec 26 NE/14, NE1/4, SE1/4	N 193,651 E 1,236,354	6410'
PA05	39° 49' 03" 108° 14' 41"	T3S R97W Sec 2 NW1/4, NW1/4, SE1/4	N 188,239 E 1,229,119	6410'
PA06	39° 48' 55" 108° 14' 5"	T3S R97W Sec 1 SW1/4, NW1/4, SW1/4	N 187,422 E 1,231,954	6770'
PA07	39° 48' 55" 108° 13' 57"	T3S R97W Sec 1 SE1/4, NW1/4, SW1/4	N 187,359 E 1,232,582	6770'

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ENVIRONMENTAL DATA COLLECTION STATION COORDINATES

STATION CODE	LATITUDE & LONGITUDE	TOWNSHIP & RANGE	STATE COORDINATES*	ELEVATION
PA08	39° 49' 18" 108° 13' 49"	T3S R97W Sec 1 NW1/4, SE1/4, NW1/4	N 189,685 E 1,233,274	6760'
PA09	39° 48' 53" 108° 12' 20"	T3S R96W Sec 6 NE1/4, SW1/4, SE1/4	N 186,920 E 1,240,131	6750'
PA10	39° 49' 30" 108° 11' 50"	T3S R96W Sec 5 NE1/4, NW1/4, NW1/4	N 190,634 E 1,242,582	6430'
PA11	39° 48' 41" 108° 11' 47"	T3S R96W Sec 5 SW1/4, SE1/4, SW1/4	N 185,662 E 1,242,645	6700'
PA12	39° 48' 47" 108° 11' 28"	T3S R96W Sec 5 SW1/4, SW1/4, SE1/4	N 186,228 E 1,244,154	6740'
PA13	39° 49' 33" 108° 11' 44"	T2S R96W Sec 32 SE1/4, SW1/4, SE1/4	N 190,885 E 1,243,085	6500'
PA14	39° 48' 22" 108° 14' 29"	T3S R97W Sec 11 NE1/4, SW1/4, NE1/4	N 184,091 E 1,229,937	6700'
PA15	39° 48' 21" 108° 14' 3"	T3S R97W Sec 12 NE1/4, SW1/4, NW1/4	N 183,902 E 1,232,017	6670'
PA16	39° 47' 56" 108° 13' 49"	T3S R97W Sec 12 NE1/4, SE1/4, SW1/4	N 181,325 E 1,233,022	6730'
PA17	39° 48' 35" 108° 13' 19"	T3S R97W Sec 12 NW1/4, NE1/4, NE1/4	N 185,285 E 1,235,474	6760'
PA18	39° 48' 31" 108° 13' 10"	T3S R97W Sec 12 SW1/4, NE1/4, NE1/4	N 184,782 E 1,236,165	6820'
PA19	39° 47' 50" 108° 12' 57"	T3S R96W Sec 7 SW1/4, SW1/4, SW1/4	N 180,697 E 1,237,045	6870'
PA20	39° 48' 4" 108° 12' 47"	T3S R96W Sec 7 SW1/4, NE1/4, SW1/4	N 182,017 E 1,237,862	6890'
PA21	39° 47' 46" 108° 12' 5"	T3S R96W Sec 18 NE1/4, NE1/4, NE1/4	N 180,068 E 1,241,074	6920'
PA22	39° 48' 16" 108° 11' 34"	T3S R96W Sec 8 SE1/4, SE1/4, NW1/4	N 183,085 E 1,243,588	6860'
PA23	39° 48' 38" 108° 10' 57"	T3S R96W Sec 8 NE1/4, NE1/4, NE1/4	E 185,222 E 1,246,542	6540'

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ENVIRONMENTAL DATA COLLECTION STATION COORDINATES

STATION CODE	LATITUDE & LONGITUDE	TOWNSHIP & RANGE	STATE COORDINATES*	ELEVATION
PA24	39° 47' 57" 108° 10' 44"	T3S R96W Sec 9 NE1/4, SW1/4, SW1/4	N 181,074 E 1,247,422	6880'
PA25	39° 48' 10" 108° 10' 24"	T3S R96W Sec 9 NE1/4, NE1/4, SW1/4	N 182,268 E 1,248,994	6520'
PA26	39° 47' 25" 108° 13' 39"	T3S R97W Sec 13 SE1/4, SE1/4, NW1/4	N 178,239 E 1,233,714	6770'
PA27	39° 47' 22" 108° 12' 58"	T3S R96W Sec 18 SW1/4, SW1/4, NW1/4	N 177,862 E 1,236,857	6980'
PA28	39° 47' 8" 108° 12' 58"	T3S R96W Sec 18 NW1/4, SW1/4, SW1/4	N 176,417 E 1,236,794	7010'
PA29	39° 46' 57" 108° 11' 20"	T3S R96W Sec 17 SW1/4, SW1/4, SE1/4	N 175,034 E 1,244,405	6700'
PA30	39° 46' 58" 108° 10' 48"	T3S R96W Sec 16 SW1/4, SW1/4, SW1/4	N 175,034 E 1,246,920	7120'
PA31	39° 47' 46" 108° 10' 45"	T3S R96W Sec 16 NE1/4, NW1/4, NW1/4	N 179,874 E 1,247,359	6920'
PA32	39° 47' 25" 108° 10' 18"	T3S R96W Sec 16 SW1/4, SW1/4, NE1/4	N 177,737 E 1,249,371	6640'
PA33	39° 46' 58" 108° 13' 00"	T3S R96W Sec 18 SW1/4, SW1/4, SW1/4	N 175,411 E 1,236,605	7060'
PA34	39° 46' 53" 108° 12' 5"	T3S R96W Sec 19 NE1/4, NE1/4, NE1/4	N 174,720 E 1,240,948	7120'
PA35	39° 45' 21" 108° 13' 6"	T3S R97W Sec 25 NE1/4, SE1/4, SE1/4	N 165,537 E 1,235,851	7400'
V. WATER				
WA01	39° 50' 31" 108° 13' 54"	T2S R97W Sec 25 SW1/4, SE1/4, SW1/4	N 197,108 E 1,233,085	6300'
WA02	39° 50' 10" 108° 14' 37"	T2S R97W Sec 35 NE1/4, SW1/4, NE1/4	N 195,034 E 1,229,685	6280'
WA03	39° 48' 48" 108° 14' 32"	T3S R97W Sec 2 NE1/4, SW1/4, SE1/4	N 186,731 E 1,229,811	6460'

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ENVIRONMENTAL DATA COLLECTION STATION COORDINATES

STATION CODE	LATITUDE & LONGITUDE	TOWNSHIP & RANGE	STATE COORDINATES*	ELEVATION
WA04	39° 47' 26" 108° 13' 35"	T3S R97W Sec 13 SW1/4, SW1/4, NE1/4	N 178,302 E 1,234,028	6700'
WA05	39° 50' 4" 108° 13' 14"	T2S R97W Sec 36 SW1/4, SE1/4, NE1/4	N 194,217 E 1,236,102	6330'
WA06	39° 49' 36" 108° 12' 25"	T2S R96W Sec 31 SE1/4, SW1/4, SE1/4	N 191,262 E 1,239,874	6360'
WA07	39° 49' 31" 108° 11' 59"	T3S R96W Sec 5 NW1/4, NW1/4, NW1/4	N 190,697 E 1,241,891	6370'
WA08	39° 49' 12" 108° 11' 8"	T3S R96W Sec 5 SW1/4, SE1/4, NE1/4	N 188,679 E 1,245,788	6400'
WA09	39° 48' 10" 108° 10' 22"	T3S R96W Sec 9 NE1/4, NE1/4, SW1/4	N 182,268 E 1,249,182	6420'
WA10	39° 47' 25" 108° 10' 24"	T3S R96W Sec 16 SE1/4, SE1/4, NW1/4	N 177,800 E 1,248,931	6580'
WA11	39° 48' 18" 108° 11' 7"	T3S R96W Sec 8 SW1/4, SE1/4, NE1/4	N 183,211 E 1,245,725	6550'
WA12	39° 46' 58" 108° 11' 25"	T3S R96W Sec 17 SW1/4, SW1/4, SE1/4	N 175,159 E 1,244,028	6700'
WA13	39° 47' 13" 108° 12' 34"	T3S R96W Sec 18 SW1/4, NW1/4, SE1/4	N 176,857 E 1,238,679	6840'
WC91/WD91 WE91/WG91	39° 47' 48" 108° 14' 20"	T3S R97W Sec 11 SE1/4, SE1/4, SE1/4	N 180,634 E 1,230,571	6873.0'
WC17/WD17 WE17/WG17	39° 46' 58" 108° 10' 51"	T3S R96W Sec 16 SW1/4, SW1/4, SW1/4	N 175,034 E 1,246,668	7038.6'
WD01	39° 48' 52" 108° 14' 3"	T3S R96W Sec 1 NE1/4, SW1/4, SW1/4	N 187,045 E 1,232,079	6763.4'
WD02	39° 48' 56" 108° 12' 22"	T3S R96W Sec 6 SE1/4, NW1/4, SE1/4	N 197,234 E 1,240,000	6737.0'
WD11/WE11	39° 48' 52" 108° 14' 35"	T3S R96W Sec 2 NW1/4, SE1/4	N 187,171 E 1,229,600	6425.0'
WD12/WG12	39° 48' 52" 108° 14' 36"	T3S R97W Sec 2 NE1/4, SW1/4, SE1/4	N 187,171 E 1,229,497	6428.8'

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* Plane Coordinate Projection Tables, Colorado, Special Publication No. 276, U. S. Government Printing Office.

ENVIRONMENTAL DATA COLLECTION STATION COORDINATES

STATION CODE	LATITUDE & LONGITUDE	TOWNSHIP & RANGE	STATE COORDINATES*	ELEVATION
WD14/WD15	39° 47' 46" 108° 13' 41"	T3S R96W Sec 7 NE1/4, SW1/4	N 180,200 E 1,238,300	6909.0'
WD18/WE18 WG18	39° 45' 19" 108° 13' 08"	T3S R97W Sec 25 SE1/4, SE1/4	N 165,438 E 1,235,125	7386.6'
WD19	39° 49' 31" 108° 11' 59"	T3S R96W Sec 5 NW1/4, NW1/4, NW1/4	N 190,760 E 1,241,891	6384.4'
WD20/WE20 WG20	39° 49' 33" 108° 12' 24"	T3S R96W Sec 31 SE1/4, SW1/4, SE1/4	N 191,011 E 1,239,937	6358.0'
WD21/WE21 WG21/WH21	39° 48' 57" 108° 13' 24"	T3S R97W Sec 13 SE1/4, SW1/4, SE1/4	N 175,348 E 1,234,782	6813.3'
WD41/WE41 WG41	39° 38' 21" 112° 10' 06"	T3S R96W Sec 7 NE1/4, SW1/4	N 182,000 E 1,238,000	6909.0'
WD51/WE51 WG51	39° 47' 36" 108° 13' 06"	T3S R97W Sec 13 NE1/4, NE1/4, NE1/4	N 180,257 E 1,236,291	6953.6'
WD52/WE52 WG52	39° 47' 48" 108° 12' 7"	T3S R96W Sec 7 SE1/4, SE1/4, SE1/4	N 180,320 E 1,240,948	6903.1'
WD57	39° 46' 47" 108° 10' 51"	T3S R96W Sec 16 SW1/4, SW1/4, SW1/4	N 175,034 E 1,246,668	7036.0'
WD61/WE61 WG61	39° 48' 13" 108° 12' 32"	T3S R96W Sec 7 NW1/4, NW1/4, SE1/4	N 182,897 E 1,239,057	6890.7'
WD90	39° 47' 46" 108° 13' 05"	T3S R97W Sec 13 NE1/4, NE1/4	N 180,312 E 1,236,375	6952.5'
WE03	39° 48' 51" 108° 11' 29"	T3S R96W Sec 5 NW1/4, SW1/4, SE1/4	N 186,605 E 1,244,091	6743.1'
WE04	39° 47' 11" 108° 12' 4"	T3S R96W Sec 17 SE1/4, NW1/4, SW1/4	N 176,542 E 1,241,074	7057.3'
WI17		T3S R96W Sec 17 SE1/4 SW1/4		6994.0'
WI18	39° 47' 46" 108° 13' 05"		N 180,300 E 1,236,375	6950.0'
WI19		T3S R96W Sec 17 SE1/4 SW1/4	N 178,394 E 1,243,549	6942.2'
WP01	39° 49' 35" 108° 11' 2"	T2S R96W Sec 32 SE1/4, SE1/4, SE1/4	N 190,948 E 1,246,291	6380'

* Plane Coordinate Projection Tables, Colorado, Special Publication No. 276, U. S. Government Printing Office.

ENVIRONMENTAL DATA COLLECTION STATION COORDINATES

STATION CODE	LATITUDE & LONGITUDE	TOWNSHIP & RANGE	STATE COORDINATES*	ELEVATION
WP02	39° 49' 41" 108° 12' 2"	T2S R96W Sec 32 NW1/4, SW1/4, SW1/4	N 1,191,702 E 1,241,702	6300'
WP03	39° 51' 03" 108° 15' 27"	T2S R97W Sec 26 NW1/4, SW1/4, NW1/4	N 200,502 E 1,225,977	6220'
WR01	40° 00' 108° 12'	T1S R96W Sec 6	OFF TRACT	6140'
WR02	40° 02'	T1N R94W Sec 7	OFF TRACT	6347'
WR03		T4S R97W Sec 34	OFF TRACT	
WR04		T2S R100W Sec 14	OFF TRACT	
WR05		T5S R94W Sec 26	OFF TRACT	
WR06		T6S R94W Sec 2	OFF TRACT	
WR07			OFF TRACT	
WS01	39° 49' 30" 108° 11' 2"	T3S R96W Sec 5 NE1/4, NE1/4, NE1/4	N 190,445 E 1,246,291	6380'
WS02	39° 48' 3" 108° 10' 16"	T3S R96W Sec 9 SW1/4, NW1/4, SE1/4	N 181,577 E 1,249,622	6540'
WS03	39° 49' 1" 108° 11' 9"	T3S R96W Sec 5 NW1/4, NE1/4, NE1/4	N 190,634 E 1,245,788	6360'
WS04	39° 48' 1" 108° 10' 13"	T3S R96W Sec 9 NE1/4, SW1/4, SE1/4	N 181,388 E 1,249,874	6550'
WS06	39° 50' 23" 108° 14' 38"	T2S R97W Sec 35 NE1/4, NW1/4, NE1/4	N 196,354 E 1,229,622	6260'
WS07	39° 50' 17" 108° 14' 33"	T2S R97W Sec 35 SW1/4, NE1/4, NE1/4	N 195,788 E 1,230,000	6280'
WS08	39° 48' 57" 108° 14' 48"	T3S R97W Sec 11 SE1/4, NE1/4, SE1/4	N 187,674 E 1,228,554	6400'
WS09	39° 47' 51" 108° 14' 53"	T3S R97W Sec 14 NW1/4, NE1/4, SW1/4	N 181,011 E 1,227,988	6550'
WS10	39° 47' 16" 108° 15' 2"	T3S R97W Sec 2 SE1/4, NE1/4, SW1/4	N 177,485 E 1,227,171	6580'

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ENVIRONMENTAL DATA COLLECTION STATION COORDINATES

STATION CODE	LATITUDE & LONGITUDE	TOWNSHIP & RANGE	STATE COORDINATES*	ELEVATION
WS11	39° 48' 13" 108° 12' 40"		N 182,900 E 1,238,400	
WS12	39° 50' 09" 108° 13' 12"		N 194,800 E 1,236,300	
WS21	39° 51' 20" 108° 19' 15"	T2S, R97W, Sec 19 SW1/4, SE1/4	OFF TRACT	
WS22	39° 49' 29" 108° 24' 56"	T2S, R98W, Sec 32 SW1/4, SE1/4	OFF TRACT	
WS23	39° 47' 22" 108° 17' 57"	T3S, R97W, Sec 17 NW1/4, SE1/4	OFF TRACT	
WS24	39° 46' 27" 108° 22' 43"	T3S, R98W, Sec 22 NW1/4, SE1/4	OFF TRACT	
WS25	39° 42' 56" 108° 29' 03"	T4S, R99W, Sec 10 NE1/4, SE1/4	OFF TRACT	
WS26	39° 47' 37" 108° 15' 51"	T3S, R97W, Sec 27 Center	OFF TRACT	
WS27	39° 40' 51" 108° 16' 50"	T4S, R97W, Sec 21 SW1/4, SE1/4	OFF TRACT	
WS28	39° 44' 50" 108° 10' 05"	T3S, R96W, Sec 33 SW1/4, NE1/4	OFF TRACT	
WS29	39° 40' 55" 108° 12' 50"	T4S, R96W, Sec 19 SW1/4, SW1/4	OFF TRACT	
WS30	39° 47' 42" 108° 06' 09"	T3S, R95W, Sec 18 NW1/4, NW1/4	OFF TRACT	
WS31	39° 48' 25" 108° 10' 34"	T3S, R96W, Sec 9 SE1/4, NW1/4	N 184,187 E 1,248,184	
WS32	39° 47' 36" 108° 14' 59"	T3S, R97W, Sec 14 NE1/4, NW1/4	OFF TRACT	
WS33	39° 47' 18" 108° 10' 22"	T3S, R96W, Sec 16 NE1/4, SW1/4	OFF TRACT	
WS34	39° 47' 17" 108° 15' 03"	T3S, R97W, Sec 14 NW1/4, SW1/4	OFF TRACT	

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* Plane Coordinate Projection Tables, Colorado, Special Publication No. 276, U.S. Government Printing Office.

ENVIRONMENTAL DATA COLLECTION STATION COORDINATES

STATION CODE+	LATITUDE & LONGITUDE	TOWNSHIP & RANGE	STATE COORDINATES*	ELEVATION
WS36	39° 48' 42" 108° 10' 52"		N 185,500 E 1,247,000	
WU01	39° 46' 10" 108° 15' 16"	T3S R97W Sec 22 E1/4, N1/4, E1/4	N 170,875 E 1,225,875	
WU02		T3S R97W Sec 8 SE1/4, S1/4, E1/4	OFF TRACT	
WU07	39° 49' 31" 108° 10' 59"	T3S R96W Sec 5 NE1/4, NE1/4, NE1/4	N 190,634 E 1,246,542	6400
WU15	39° 47' 20" 108° 10' 23"	T3S R96W Sec 16 NE1/4, NE1/4, SW1/4	N 177,234 E 1,248,931	6600
WU22	39° 48' 45" 108° 10' 60"	T3S R96W Sec 5 SE1/4, SE1/4, SE1/4	N 185,914 E 1,246,354	6460
WU25	39° 46' 57" 108° 11' 21"	T3S R96W Sec 17 SE1/4, SW1/4, SE1/4	N 175,097 E 1,244,342	6680'
WU28	39° 48' 42" 108° 11' 0	T3S R96W Sec 5 SE1/4, SE1/4, SE1/4	N 185,662 E 1,246,291	6460'
WU33	39° 47' 15" 108° 12' 34"	T3S R96W Sec 18 SE1/4, NE1/4, SW1/4	N 177,045 E 1,238,742	6860'
WU36	39° 49' 28" 108° 11' 54"	T3S R96W Sec 5 NE1/4, NW1/4, NW1/4	N 190,382 E 1,242,268	6380'
WU39	39° 49' 34" 108° 12' 27"	T2S R96W Sec 31 SW1/4, SW1/4, SE1/4	N 191,137 E 1,239,685	6380'
WU42	39° 50' 3" 108° 13' 13"	T2S R97W Sec 36 SE1/4, SE1/4, NE1/4	N 194,091 E 1,236,228	6430'
WU45	39°50'8" 108°13'14"	T2S R97W Sec 36 SE1/4, NE1/4		
WU50	39° 47' 43" 108° 13' 39"	T3S R97W Sec 13 NE1/4, NE1/4, NW1/4	N 180,000 E 1,233,714	6660'
WU52	39° 48' 49" 108° 14' 34"	T3S R97W Sec 2 NE1/4, SW1/4, SE1/4	N 186,857 E 1,229,685	6460'
WU58	39° 50' 12" 108° 14' 36"	T2S R97W Sec 35 NE1/4, SW1/4, NE1/4	N 195,222 E 1,229,748	6280'

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+ Multiple station codes at the same location indicates samples taken at different depths.

No. 276, U. S. Government Printing Office.

ENVIRONMENTAL DATA COLLECTION STATION COORDINATES

STATION CODE+	LATITUDE & LONGITUDE	TOWNSHIP & RANGE	STATE COORDINATES*	ELEVATION
WU61	39° 51' 3" 108° 15' 31"	T2S R97W Sec 27 NE1/4, SE1/4, NE1/4	N 220,502 E 1,225,600	6220'
WV01	39° 49' 26" 108° 16' 39"	T3S R97W Sec 4	OFF TRACT	6411'
WV02	39° 48' 35" 108° 08' 49"	T3S R96W Sec 10	OFF TRACT	6490'
WV03	39° 48' 00" 108° 05' 11"			
WV04	39° 09' 19" 108° 13' 28"	T4S R96W Sec 9	N 675,219 E 1,249,792	
WV05	39° 41' 53" 108° 05' 24"	T4S R95W Sec 18	OFF TRACT	7420'
WV06				
WV07			N 185,565 E 1,234,236	6794.8'
WV08			N 188,206 E 1,233,371	6704.1'
WV09			N 188,055 E 1,231,357	6692.7'
WV37	39° 48' 01" 108° 12' 42"	T3S R96W Sec 7 NE1/4, SW1/4	N 181,750 E 1,238,250	6909.0'
WV40	39° 48' 01" 108° 12' 14"	T3S R96W Sec 7 NE1/4, SW1/4	N 181,750 E 1,238,125	6909.0'
WW12	39° 48' 42" 108° 13' 29"	T3S R97W Sec 1 SE1/4, SW1/4, SE1/4	N 185,977 E 1,234,720	6780'
WW13	39° 47' 46" 108° 13' 05"		N 180,272 E 1,236,438	6953.6'
WW22	39° 48' 42" 108° 13' 29"	T3S R97W Sec 1 SE1/4, SW1/4, SE1/4	N 185,977 E 1,234,720	6764.0'
WW32		T3S R97W Sec 12	N 188,516 E 1,237,012	6785.0'

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ENVIRONMENTAL DATA COLLECTION STATION COORDINATES

STATION CODE+	LATITUDE & LONGITUDE	TOWNSHIP & RANGE	STATE COORDINATES*	ELEVATION
WX02	39° 48' 56" 108° 12' 22"	T3S R96W Sec 6 SE1/4, NW1/4, SE1/4	N 187,234 E 1,240,000	6730'
WX04	39° 47' 11" 108° 12' 4"	T3S R96W Sec 17 SE1/4, NW1/4, SW1/4	N 176,542 E 1,241,074	7040'
WX10	39° 47' 46" 108° 13' 06"	T3S R97W Sec 13 NE1/4, NE1/4, NE1/4	N 180,257 E 1,236,291	6950'
WX12/WY12	39° 48' 52" 108° 14' 36"	T3S R97W Sec 2 NE1/4, SW1/4, SE1/4	N 187,171 E 1,229,497	6440'
WX17/WY17	39° 46' 58" 108° 10' 51"	T3S R96W Sec 16 SW1/4, SW1/4, SW1/4	N 175,034 E 1,246,668	7040'
WX19	39° 49' 31" 108° 11' 59"	T3S R96W Sec 5 NW1/4, NW1/4, NW1/4	N 190,760 E 1,241,891	6370'
WX20	39° 49' 33" 108° 12' 24"	T2S R96W Sec 31 SE1/4, SW1/4, SE1/4	N 191,011 E 1,239,937	6350'
WX21	39° 48' 57" 108° 13' 24"	T3S R97W Sec 13 SE1/4, SW1/4, SE1/4	N 175,348 E 1,234,782	6870'
WX32	39° 48' 26" 108° 13' 36"	T3S R97W Sec 12 NW1/4, SW1/4, NE1/4	N 184,342 E 1,234,091	6840'
WX33	39° 49' 0" 108° 13' 28"	T3S R97W Sec 1 SE1/4, NW1/4, SE1/4	N 187,800 E 1,234,845	6720'
WX38	39° 48' 05" 108° 12' 40"	T3S R96W Sec 7 NE1/4, SW1/4	N 182,100 E 1,238,400	6909.0'
WX41	39° 49' 32" 108° 13' 08"		N 191,000 E 1,236,500	6460.0'
WX44/WY45 /WY46	39° 48' 1" 108° 12' 44"	T3S R96W Sec 7 SW1/4, NE1/4, SW1/4	N 181,765 E 1,238,114	6910'
WX55/WY52 /WY54	39° 47' 48" 108° 12' 7"	T3S R96W Sec 7 SE1/4, SE1/4, SE1/4	N 180,320 E 1,240,948	6900'
WX63/WY61 WY62	39° 48' 13" 108° 12' 32"	T3S R96W Sec 7 NW1/4, NW1/4, SE1/4	N 182,897 E 1,239,057	6870'

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ENVIRONMENTAL DATA COLLECTION STATION COORDINATES

STATION CODE+	LATITUDE & LONGITUDE	TOWNSHIP & RANGE	STATE COORDINATES*	ELEVATION
WX64/WY64	39° 55' 16" 108° 13' 01"		OFF TRACT	7178.0'
WX65/WY65	39° 51' 36" 108° 21' 00"		OFF TRACT	6390.0'
WX67/WY67	39° 52' 55" 108° 15' 42"		OFF TRACT	6740.0'
WX69/WY69	39° 53' 10" 108° 05' 04"		OFF TRACT	7350.0'
WX71/WY71	39° 47' 47" 108° 21' 49"	T3S R98W Sec 11	OFF TRACT	6580.0'
WX72/WY72	39° 45' 40" 108° 19' 12"		OFF TRACT	6805.0'
WX73	41° 09' 26" 108° 08' 15"	T4S R95W Sec 32	N 675,219 E 1,273,792	8142.3'
WX74			OFF TRACT	
WX75	41° 08' 48" 108° 09' 03"	T5S R95W Sec 6	N 671,467.4 E 1,269,951.5	7583.2'
WX82	39° 48' 13" 108° 10' 13"		N 182,562 E 1,249,938	6909.0'
WX92/WY91	39° 47' 48" 108° 14' 20"	T3S R97W Sec 11 SE1/4, SE1/4, SE1/4	N 180,634 E 1,230,571	6870'
WY01	39° 48' 52" 108° 14' 3"	T3S R97W Sec 1 NE1/4, SW1/4, SW1/4	N 187,045 E 1,232,079	6780'
WY03	39° 48' 51" 108° 11' 29"	T3S R96W Sec 5 NW1/4, SW1/4, SE1/4	N 186,605 E 1,244,091	6740'
WY44	39° 48' 01" 108° 12' 44"		N 181,772 E 1,238,125	6909.0'
WY66	39° 50' 41" 108° 16' 04"	T2S R97W Sec 27	OFF TRACT	6286.0'
WY68	39° 45' 55" 108° 12' 31"		OFF TRACT	6840.0'

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ENVIRONMENTAL DATA COLLECTION STATION COORDINATES

STATION CODE+	LATITUDE & LONGITUDE	TOWNSHIP & RANGE	STATE COORDINATES*	ELEVATION
WY70	39° 45' 51"	T3S R99W Sec 26	OFF TRACT	7070.0'
WY71	108° 28' 01"	T4S R96W Sec 6	OFF TRACT	7145.0'
WY72	108° 12' 58"			
WY75	39° 45' 59"	T3S R96W Sec 29	N 169,250	6820.0'
	108° 21' 49"		E 1,242,500	7020.0'
	108° 25' 35"			
WY76	39° 45' 02"	T3S R96W Sec 33	OFF TRACT	6865.0'
	108° 10' 04"	T3S R96W Sec 9	N 182,457	6540'
	108° 10' 24"	NE1/4, NE1/4, SW1/4	E 1,249,057	
WY77	41° 08' 44"		N 672,812	7777.8'
	108° 21' 09"		E 1,214,479	6720'
	108° 13' 20"	SE1/4, NW1/4, SE1/4	E 1,235,461	
WY78	39° 43' 53"	T4S R96W Sec 6	OFF TRACT	7145.0'
	108° 12' 58"			
WY79	39° 51' 10"	T2S R98W Sec 30	OFF TRACT	7020.0'
	108° 25' 35"			
WY81	39° 48' 12"	T3S R96W Sec 9	N 182,457	6540'
	108° 10' 24"	NE1/4, NE1/4, SW1/4	E 1,249,057	
WZ01	39° 42' 02"	T3S R96W Sec 1	N 188,015	6720'
	108° 13' 20"	NE1/4, NW1/4, SE1/4	E 1,235,461	
WZ02	39° 48' 28"		N 184,592	
	108° 13' 27"		E 1,234,798	
WZ03	39° 48' 26"		N 184,306	
	108° 13' 28"		E 1,234,705	

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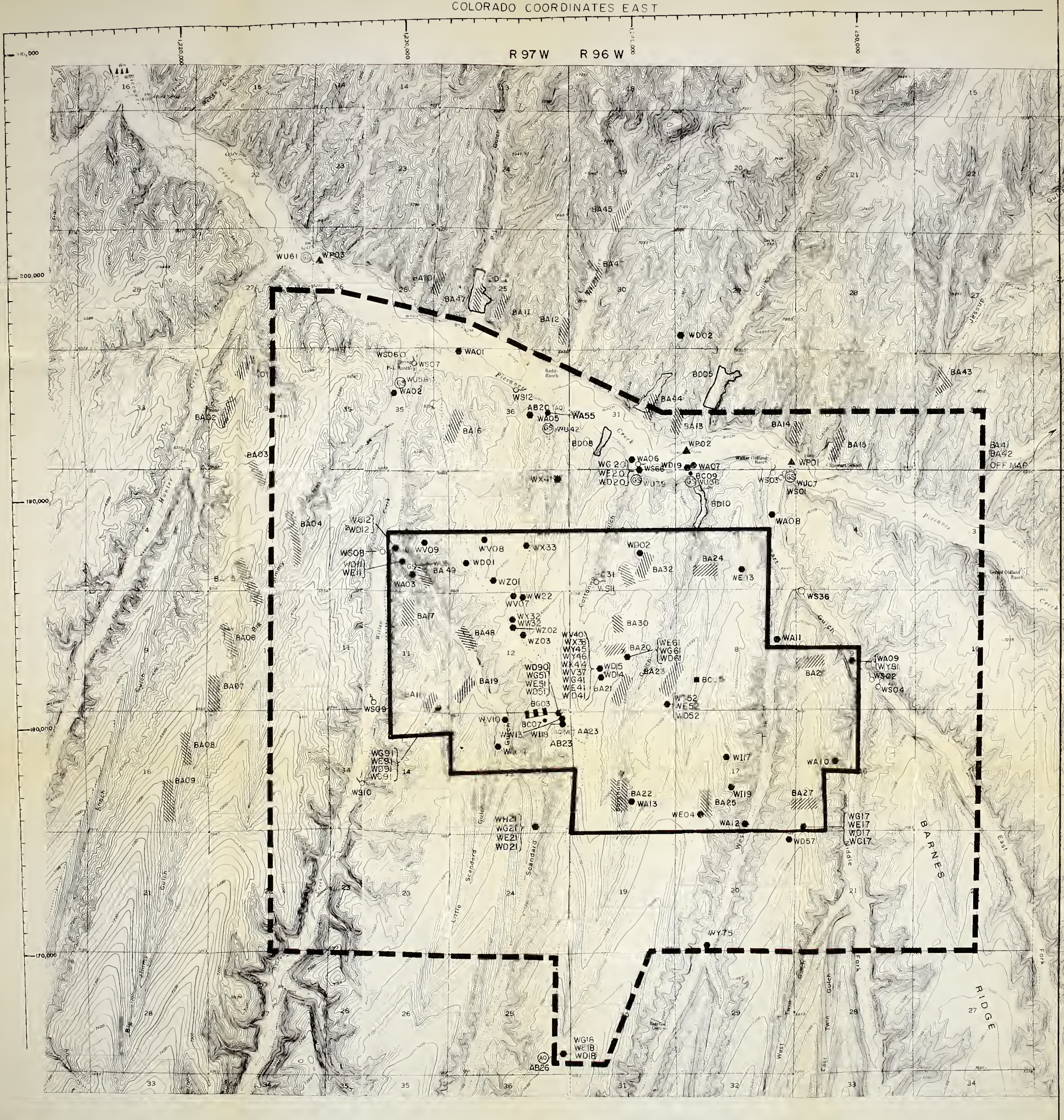
COLORADO COORDINATES EAST
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R 96 W
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1,250,000
200,000
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180,000
170,000
WU61
WP03
WS06
WS07
WU58
WA01
WA02
WS12
AB20
WA05
WA55
WU42
BA10
BA47
BA11
BA12
BA45
BA41
WD02
BD05
BA44
BA13
BA14
BA15
BA43
BA41
BA42
OFF MAP
BD08
WP02
WP01
WA06
WG20
WE20
WD20
WS66
WU39
WD19
WA07
BC09
WU36
WS03
WU07
WS01
WX41
BD10
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WS36
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WV40
WX38
WY45
WY46
WX44
WV37
WG41
WE41
WD41
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WD15
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BA20
WE61
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WE17
WD17
WC17
WD57
WY75
WG18
WE18
WD18
AB26
Piceance
Creek
Hunter
Creek
Big Jimmy Gulch
Willow Creek
Cottonwood Gulch
Little Scandard Gulch
Scandard Gulch
West Fork
Middle Fork
East Fork
BARNES RIDGE
West Twin Gulch
East Twin Gulch
Stewart Gulch
Jessup Gulch
Corral Gulch
Big Jimmy Gulch
Redd Ranch
P-L Ranch
Walter Oldland Ranch
Stewart School
Gerald Oldland Ranch
Watson Gulch
Oldland

INTERIM MONITORING PROGRAM

July 8, 1982

(GS)	Water Gaging Station	
(AQ)	Air Quality Station	
▲	Aquatic Sampling Site PC—Piceance Creek	
(MET)	Meteorological Tower 200'	
VO VF	Vegetotian Site	VO= Open (50 x 70 m) VF= Fenced (50x70m)
■	Micrenvionmental Stations	
⬢	Well Hole Locations	
▨	Deer Pellet and Browse Utilization Transects	
▩	Deer Mortality Plots	

5.1 Brush Beating Project: Vegetation Analysis

Vegetation sampling consisted of sampling herbaceous species for species frequency and annual production. Sampling was done along randomly located transect lines, one each in both gulches where beating occurred and one control transect (no brush beating). Each transect consisted of sampling 25 one-square-meter quadrats.

Frequency was determined for individual species encountered at each site. Mean annual production was determined for individual species as well as entire sites. Production was determined using a double sampling approach. The data and results are listed in Tables 5.1-1 through 5.1-10.

Mean herbaceous production for the brush beating sites was well above that of the control area. However, the difference between the beating sites and the control site was not as much in 1982 as the past two years (all sites had higher production values in 1982). Mean herbaceous production in Oldland Gulch was 69.38 g/m^2 (619 lbs/acre), Gardenhire Gulch production was 68.76 g/m^2 (613 lbs/acre), and in the Control site production was 38.38 g/m^2 (339 lbs/acre).

Species frequency was similar for both the beating sites and the control site.

5.2 Excess Mine Water Disposal - Land Application System Impacts

The sprinkler-irrigation system which was used to dispose of excess mine water during the late spring, summer and early fall of 1980 and 1981 was not used during 1982. However, the concentration and build-up of salts and specific ions in the soils and vegetation from the applied water of the two previous years does not necessarily disappear once irrigation ceases.

Therefore, a chemical analysis of the soils and vegetation was conducted in October, 1982 (end of the growing season) in order to determine the concentration levels of salts and ions in the soils and vegetation one year following irrigation.

Vegetation and soil samples were taken from the same treatment areas, were analyzed using the same methods, similar sampling period, and were analyzed for the same parameters as the two previous years.

Soil Chemical Properties

The soil parameters analyzed were pH, electrical conductivity (ECe), exchangeable sodium percentage (ESP), and Boron (B). Values for treatment, depth, and replications are presented in Tables 5.2-1 and 5.2-2. In order to determine what is happening with these parameters in the soil, concerning toxic concentrations, or continued build-up in soils, or decreasing concentrations in soils one year after irrigation has stopped, three questions were asked: 1) Are 1982 levels less than levels that could be considered toxic to plant growth?

TABLE 5.1-1 Fresh weight estimates (grams) for Oldland Gulch Brush Beating Area. 1982

Quadrat Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Agropyron cristatum		13				8	5	64			16	48	7	12	18					22	10			42	58
Agropyron dasystachyum						62					4														
Agropyron intermedium				22		2						3			14						8			30	14
Agropyron smithii	124	135	32	48	74	4			66	20		32	49	69	4	94	86	14	102			13	65		3
Artemisia ludoviciana	11										4										16	2		4	
Bromus tectorum	1	2	4	3		1	12	3	28	35	32	5	15	4	16	1	14	2	16	15	7	9	10	2	1
Chenopodium album	<1												<1			<1									
Collinsia parviflora					2																				
Descurainia pinnata		<1		1	5				2					1		<1	1	<1			<1				
Draba spp.													<1		6										
Elymus cinereus								28																22	
Elymus junceus											5	11	37	4	7									10	5
Erysimum asperum						21	1				5		3		2				4	2			3		
Lappula redowskii	<1								3	1			<1							<1			<1		
Medicago sativa														3											
Oryzopsis hymenoides		7				11	84	29				10	44			17			6	9	75	82	21	29	34
Poa spp.					2																				
Sitanion hystrix																						4			
Spharalcea coccinea																							3		
Sporobolus cryptandrus																		2							
Stipa comata		28	84	42												10	5	102							
Tragopogon dubius																		4							
TOTAL BIOMASS	136	185	120	116	83	109	102	124	99	56	66	109	155	93	57	122	106	124	128	48	116	110	102	139	115

TABLE 5.1-2 Fresh weight estimates (grams) for Gardenhire Gulch. 1982

Quadrat Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Agropyron cristatum			58				34							30	27			14						10	25
Agropyron dasystachyum		18	15																						
Agropyron smithii	87	144		32	45	21			18	39							96	10	65		105	116	32		35
Agropyron trachycaulum											72														
Artemisia frigida											48				32	25								20	18
Artemisia ludoviciana															9										
Aster spp.						1										2									
Bouteloua gracilis			2				4						12	2											
Bromus inermis							3																	6	
Bromus tectorum		11	25	4	28	3	11	18	3	8	16	35	32	44	35	6	15	12	7	18	4	7	4	48	19
Chenopodium album																							2		
Descurainia pinnata	<1		<1	1	<1					1												1	15		
Draba spp.						5																	18		
Erysimum asperum				2			10	4	4	2		14						2				5			2
Kochia spp.		<1				<1	1					<1	<1		<1										
Lappula redowskii									1	<1						1	<1								
Medicago sativa																	10								8
Oryzopsis hymenoides			17				8			42	12				9	14			15	20	12	5	62	54	10
Sitanion hystrix														5											
Sporobolus cryptandrus		28																							
Stipa comata	40		5	65	48	76		104	25	13		10	36						3	44					
TOTAL BIOMASS	127	201	122	104	121	106	71	126	51	105	148	59	80	81	112	48	121	38	90	82	121	134	133	138	11

TABLE 5.1-3 Fresh weight estimates (grams) for Brush Beating Control Area. 1982.

Quadrat Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Agropyron smithii						46	115		27	31		16	26	29		95	47	16	17	10		58	13		104
Artemisia frigida			12												10						2				4
Artemisia ludoviciana				14	12							9											6		10
Astragalus spp.									2																
Bouteloua gracilis																				7	4	2	3		
Chenopodium spp.						<1						<1													
Descurainia pinnata	<1					1	2			<1				<1			<1	<1	<1	<1					
Erysimum asperum	9					4	11																		
Lappula redowskii						<1	<1													<1					
Oryzopsis hymenoides	19	39	12	18	8			47	18	15	95	34	24				8				20		24	69	6
Senecio multilobatus																			4						
Sitanion hystrix		7								3									4						
Sporobolus cryptandrus													8						5						
Stipa comata					64	10		4	9					50	54		3		18	38					
Tragopogon dubius								3																	
Bromus tectorum	6	3	10	<1	<1	4	1		<1	6	1	5	8	<1	2	11		<1	17	3	7	9	2	12	<1
TOTAL BIOMAS	34	49	34	32	84	65	129	54	56	55	96	64	66	79	66	106	58	16	65	58	33	69	48	81	124

TABLE 5.1-4 Oven dry weight (grams) for Oldland Gulch brush beating area. 1982

	Quadrat Numbers							
Species	1	6	13	16	24			
Agropyron cristatum	-	1.89	3.66	-	30.38			
Agropyron dasystachyum	-	36.49	-	-	-			
Agropyron intermedium	-	0.85	-	-	20.52			
Agropyron smithii	80.26	5.33	24.03	47.69	-			
Artemisia ludoviciana	3.03	-	-	-	0.96			
Bromus tectorum	0.19	0.33	19.21	0.58	2.30			
Chenopodium album	0.03	-	0.07	0.02	-			
Collinsia parviflora	-	-	-	-	-			
Descurainia pinnata	-	-	-	0.04	-			
Draba spp.	-	-	0.04	-	-			
Elymus cinereus	-	-	-	-	15.10			
Elymus junceus	-	-	12.25	-	6.26			
Erysimum asperum	-	15.08	0.77	-	-			
Lappula redowskii	0.03	-	0.04	-	-			
Medicago sativa	-	-	-	-	-			
Oryzopsis hymenoides	-	11.35	32.32	7.95	22.02			
Poa spp.	-	-	-	-	-			
Sitanion hystrix	-	-	-	-	-			
Sphaeralcea coccinea	-	-	-	-	-			
Sporobolus cryptandrus	-	-	-	-	-			
Stipa comata	-	-	-	6.53	-			
Tragopogan dubius	-	-	-	-	-			
TOTAL BIOMASS	83.54	71.32	92.39	62.81	97.54			

TABLE 5.1-5 Oven dry weight (grams/m^2) for Gardenhire Gulch brush beating area. 1982

Species	Quadrat Numbers 1	2	3	11	19			
Agropyron cristatum	-	-	42.75	-	-			
Agropyron dasystachyum	-	7.44	7.15	-	-			
Agropyron smithii	55.17	95.84	3.49	-	32.59			
Agropyron trachycaulum	-	-	-	52.33	-			
Artemisia frigida	-	-	-	11.48	-			
Aster spp.	-	-	-	-	-			
Bouteloua gracilis	-	-	0.48	-	-			
Bromus inermis	-	-	-	-	-			
Bromus tectorum	-	5.26	33.31	9.43	11.47			
Salsola	0.02	0.02	0.02	-	-			
Descurainia pinnata	0.02	-	0.05	-	-			
Draba spp.	-	-	-	-	-			
Erysimum asperum	-	-	-	-	-			
Kochia spp.	-	0.02	-	-	-			
Lappula redowskii	-	-	-	-	-			
Medicago sativa	-	-	-	-	-			
Oryzopsis hymenoides	-	-	10.53	5.44	8.46			
Sitanion hystrix	-	-	-	-	-			
Sporobolus cryptandrus	-	12.59	-	-	-			
Stipa comata	35.22	-	3.17	-	-			
TOTAL BIOMASS	90.43	121.17	100.95	78.68	52.52			

TABLE 5.1-6 Oven dry weight (grams/m^2) for Brush Beating Control Area. 1982

	Quadrat Numbers							
Species	1	6	11	14	21			
Agropyron smithii	-	23.41	-	12.64	-			
Artemisia frigida	-	-	-	-	0.24			
Artemisia ludoviciana	-	-	-	-	-			
Astragalus spp.	-	-	-	-	-			
Bouteloua gracilis	-	-	-	-	1.53			
Bromus tectorum	4.08	3.04	0.56	0.04	6.60			
Chenopodium album	-	0.02	-	-	-			
Descurainia pinnata	0.04	0.22	-	0.02	-			
Erysimum asperum	4.77	1.88	-	-	-			
Lappula redowskii	-	0.04	-	-	-			
Oryzopsis hymenoides	13.22	-	55.27	-	14.27			
Senecio multilobatus	-	-	-	-	-			
Sitanion hystrix	-	-	-	-	-			
Sporobolus cryptandrus	-	-	-	-	-			
Stipa comata	-	3.58	-	22.58	-			
Tragopogan dubius	-	-	-	-	-			
TOTAL BIOMASS	22.11	32.19	55.83	35.28	22.64			

TABLE 5.1-7 Regression Equations for converting fresh weight estimates to oven dry weights for Brush Beating and Control Areas. 1982

Species	Regression Equation	Correlation Coefficient
Agropyron cristatum	y = 0.79x - 3.13	0.99
Agropyron Dasystachyum	y = 0.64x - 3.24	0.99
Agropyron intermedium	y = 0.70x - 0.55	1.00
Agropyron smithii	y = 0.67x - 5.79	0.98
Artemisia frigida	y = 0.24x + 0.03	0.99
Bouteloua gracilis	y = 0.52x - 0.57	1.00
Bromus tectorum	y = 1.17x - 1.19	0.92
Chenopodium album		
Descurainia pinnata	y = 0.21x + 0.01	0.99
Elymus junceus	y = 0.20x + 6.49	0.61
Erysimum asperum	y = 0.79x - 1.66	0.99
Lappula redowskii		
Oryzopsis hymenoides	y = 0.59x + 1.24	0.98
Stipa comata	y = 0.61x + 0.25	0.88

Due to insufficient data for some species, it is not possible to calculate regression equations for those species, therefore, the following applies for converting fresh estimated weights to oven dry weights:

- *Artemisia frigida* and *A. ludoviciana* data were pooled together to calculate a regression equation for both species. This was also done for *Elymus cinereus* and *E. junceus*.

- The regression equation for *Descurainia pinnata* was used as a conversion for *Chenopodium album*, *Collinsia parviflora*, *Kochia* spp, and *Lappula redowskii*.

- The regression equation for *Agropyron cristatum* was used as a conversion for *Sitanion hystrix*.

- The regression equation for *Artemisia frigida* was used as a conversion for *Aster* spp., *Medicago sativa*, *Astragalus* spp., *Senecio multilobatus*, *Sphaeralcea coccinea*, and *Tragapogon dubius*.

- The regression equation for *Bromus tectorum* was used as a conversion for *Poa* spp.

- The regression equation for *Stipa comata* was used as a conversion for *Bromus inermis*.

- The regression equation for *Oryzopsis hymenoides* was used as a conversion for *sporobolus cryptandrus*.

- The regression equation for *Erysimum asperum* was used as a conversion for *Draba* spp.

TABLE 5.1-8 Mean production ± the standard error of the mean (S.E.), frequency, and range of observed values for quadrats in Oldland Brush Beating Area, 1982. Based on data derived from regression equations. Production values in grams/meter^2.

Species	Mean + S.E.	Sample Size	Frequency (%)	Range of Values
Agropyron cristatum	8.62 ± 2.87	25	52	0 - 47.62
Agropyron dasystachyum	1.46 ± 1.46	25	8	0 - 36.44
Agropyron intermedium	2.46 ± 1.07	25	28	0 - 20.52
Agropyron smithii	23.65 ± 5.37	25	76	0 - 84.43
Artemisia ludoviciana	0.36 ± 0.19	25	20	0 - 3.87
Bromus tectorum	9.96 ± 2.32	25	96	0 - 39.61
Chenopodium album	0.005 ± 0.003	25	12	0 - 0.07
Collinsia parviflora	0.017 ± 0.017	25	4	0 - 0.43
Descurainia pinnata	0.09 ± 0.05	25	36	0 - 1.05
Draba spp.	0.12 ± 0.12	25	8	0 - 3.08
Elymus cinereus	0.93 ± 0.64	25	8	0 - 12.23
Elymus junceus	2.46 ± 0.84	25	28	0 - 14.07
Erysimum asperum	0.80 ± 0.60	25	32	0 - 14.88
Lappula redowskii	0.04 ± 0.03	25	24	0 - 0.64
Medicago sativa	0.03 ± 0.03	25	4	0 - 0.75
Oryzopsis hymenoides	11.57 ± 3.23	25	56	0 - 51.10
Poa spp.	0.046 ± 0.046	25	4	0 - 1.15
Sitanion hystrix	0.001 ± 0.001	25	4	0 - 0.03
Sphaeralcea coccinea	0.03 ± 0.03	25	4	0 - 1.18
Sporobolus cryptandrus	0.05 ± 0.05	25	4	0 - 0.03
Stipa comata	6.64 ± 3.27	25	24	0 - 62.18
Tragopogon dubius	0.04 ± 0.04	25	4	0 - 0.99
TOTAL	69.38 ± 3.30	25		37.30 - 115.43
Number of Species/m^2	5.36 ± 0.28			3 - 9

TABLE 5.1-9 Mean production ± the standard error of the mean (S.E.), frequency, and range of observed values for quadrats in Gardenhire Gulch Brush Beating Area, 1982. Based on data derived from regression equations. Production values in grams/meter^2.

Species	Mean ± S.E.	Sample Size	Frequency (%)	Range of Values
Agropyron cristatum	5.40 ± 2.16	25	28	0 - 42.86
Agropyron dasystachyum	0.59 ± 0.41	25	8	0 - 8.28
Agropyron smithii	19.35 ± 5.41	25	70	0 - 90.44
Agropyron trachycaulum	2.09 ± 2.09	25	4	0 - 52.33
Artemisia frigida	1.38 ± 0.61	25	20	0 - 11.55
Artemisia ludoviciana	0.09 ± 0.09	25	4	0 - 2.19
Aster spp.	0.03 ± 0.02	25	8	0 - 0.51
Bouteloua gracilis	0.33 ± 0.23	25	16	0 - 5.73
Bromus inermis	0.24 ± 0.17	25	8	0 - 3.91
Bromus tectorum	18.11 ± 3.16	25	96	0 - 54.77
Chenopodium album	0.017 ± 0.017	25	4	0 - 0.43
Descurainia pinnata	0.15 ± 0.12	25	28	0 - 3.11
Draba spp.	0.59 ± 0.51	25	8	0 - 12.56
Erysimum asperum	0.84 ± 0.44	25	36	0 - 6.22
Kochia spp.	0.013 ± 0.009	25	24	0 - 0.22
Lappula redowskii	0.018 ± 0.012	25	16	0 - 0.22
Medicago sativa	0.18 ± 0.12	25	8	0 - 2.43
Oryzopsis hymenoides	7.29 ± 2.13	25	52	0 - 38.04
Sitanion hystrix	0.03 ± 0.03	25	4	0 - 0.82
Sporobolus cryptandrus	0.50 ± 0.50	25	4	0 - 12.59
Stipa comata	11.51 ± 3.53	25	48	0 - 63.39
TOTAL	68.76 ± 4.70	25	100	21.69 - 122.96
Number of Species/m^2	4.80 ± 0.26			3 - 7

TABLE 5.1-10 Mean production ± the standard error of the mean (S.E.), frequency, and range of observed values for quadrats in the Control Area (for comparison to brush beating areas), 1982. Based on data derived from regression equations. Production in grams/meter^2.

Species	Mean + S.E.	Sample Size	Frequency (%)	Range of Values
Agropyron smithii	13.90 ± 4.23	25	60	0 - 71.07
Artemisia frigida	0.27 ± 0.15	25	16	0 - 2.91
Artemisia ludoviciana	0.50 ± 0.21	25	20	0 - 3.39
Astragalus spp.	0.02 ± 0.02	25	4	0 - 0.51
Bouteloua gracilis	0.24 ± 0.14	25	16	0 - 3.10
Bromus tectorum	4.19 ± 1.03	25	92	0 - 18.63
Chenopodium album	0.002 ± 0.002	25	8	0 - 0.02
Descurainia pinnata	0.03 ± 0.02	25	36	0 - 0.43
Erysimum asperum	0.55 ± 0.35	25	12	0 - 7.00
Lappula redowskii	0.003 ± 0.002	25	12	0 - 0.04
Oryzopsis hymenoides	11.62 ± 2.88	25	64	0 - 57.63
Senecio multilobatus	0.04 ± 0.04	25	4	0 - 0.99
Sitanion hystrix	0.10 ± 0.09	25	12	0 - 2.40
Sporobolus cryptandrus	0.41 ± 0.29	25	8	0 - 5.96
Stipa comata	6.16 ± 2.37	25	36	0 - 39.11
Tragopogon dubius	0.03 ± 0.03	25	4	0 - 0.75
TOTAL	38.08 ± 3.53	25	100	5.98 - 78.54
Number of Species/m^2	4.04 ± 0.30			2 - 7

TABLE 5.2-1 Values of pH and electrical conductivity (ECe) from soils samples taken June and December 1980, October 1981 and October 1982.

Treatment # and Replication #	Depth Interval in Feet	pH (log [H])				ECe (mmhos / cm)			
		June	Dec	Oct'81	Oct'82	June	Dec	Oct'81	Oct'82
5a 1	0-1	8.0	8.3	8.6	7.8	0.6	0.9	1.9	1.6
	1-2	7.9	- -	8.7	7.9	0.8	- -	1.0	1.5
5a 2	0-1	7.8	8.4	8.5	8.2	0.9	1.1	2.2	1.4
	1-2	7.7	- -	8.3	8.0	1.0	- -	1.8	1.4
5a 3	0-1	7.6	8.5	8.7	8.0	1.2	1.1	1.8	1.8
	1-1.5	8.0	- -	8.6	7.9	1.0	1.4	1.7	1.5
5a 4	0-1	7.5	8.2	8.8	8.0	1.0	1.4	1.7	1.9
	1-2	8.0	- -	- -	7.9	0.5	- -	- -	1.1
5b 1	0-1	7.9	8.2	8.5	7.9	0.6	0.8	1.3	1.2
	1-2	7.7	- -	8.4	7.9	0.8	- -	0.8	1.2
	2-2.5	8.2	- -	8.4	7.9	0.6	- -	- -	0.96
5b 2	0-1	7.5	8.5	8.7	7.9	1.4	1.0	1.31	1.6
	1-2	- -	- -	8.2	8.1	- -	- -	1.2	1.5
5b 3	0-1	7.9	8.3	8.8	8.1	0.9	0.7	1.1	1.6
	1-2	7.9	- -	8.5	7.7	0.7	- -	0.8	1.4
	2-2.5	7.7	- -	- -	7.6	1.0	- -	- -	1.3
5b 4	0-1	7.8	8.2	8.7	8.1	0.5	0.7	1.1	1.2
	1-2	7.9	- -	8.5	7.8	0.6	- -	0.7	1.0
	2-2.5	8.3	- -	- -	7.6	0.6	- -	- -	0.84
5c 1	0-1	7.5	8.3	8.7	8.1	0.4	1.0	0.7	0.70
	1-2	7.8	- -	8.3	7.4	0.4	- -	0.7	0.56
5c 2	0-1	6.9	8.1	8.6	7.9	0.4	0.5	0.9	1.1
	1-2	7.6	- -	8.2	7.7	0.3	- -	0.8	0.58
5c 3	0-1	7.3	8.0	8.2	8.0	0.5	0.4	0.8	0.74
	1-2	7.8	- -	8.4	7.8	0.4	- -	1.0	0.78
5c 4	0-1	7.5	8.3	8.4	8.0	0.4	2.2	0.8	0.74
	1-2	7.9	- -	8.4	7.9	0.4	- -	0.7	0.69

TABLE 5.2-1 Values of pH and electrical conductivity (ECe) (Continued)

Treatment # and Replication #	Depth Interval in Feet	pH (log [H]) June	Dec	Oct'81	Oct'82	ECe (mmhos / cm) June	Dec	Oct'81	Oct'82
7c 1	0-1	7.9	8.7	8.6	8.0	0.4	0.5	1.0	0.92
	1-1.5	7.7	- -	8.6	7.8	0.5	- -	1.1	0.74
7c 2	0-1	7.7	- -	8.6	8.0	0.5	- -	0.9	1.3
	1-1.5	7.7	- -	- -	7.7	0.8	- -	- -	3.4
7c 3	0-1	7.7	- -	8.6	7.7	0.8	- -	1.0	7.2
	1-2	8.5	- -	- -	7.8	1.7	- -	- -	9.2
7c 4	0-1	8.3	8.4	8.9	8.1	0.7	0.5	0.9	1.4
	1-2	8.6	- -	- -	7.6	1.5	- -	- -	1.2
Control 1	0-1	- -	- -	8.0	7.7	- -	- -	0.5	0.86
Control 2	0-1	- -	- -	7.7	7.6	- -	- -	0.8	0.66
	1-2	- -	- -	8.0	7.6	- -	- -	0.4	0.56
Control 3	0-1	- -	- -	7.9	7.4	- -	- -	0.7	0.56
	1-2	- -	- -	8.2	7.5	- -	- -	0.3	0.52
Control 4	0-1	- -	- -	8.0	7.5	- -	- -	1.1	0.54
	1-2	- -	- -	8.5	7.6	- -	- -	0.7	0.42

TABLE 5.2-2 Values of exchangeable sodium percentage (ESP), and boron (ppm) from soils samples taken June and December 1980, October 1981, and October 1982.

Treatment # and Replication #	Depth Interval in Feet	ESP (%)				Boron (ppm)			
		June	Dec	Oct'81	Oct'82	June	Dec	Oct'81	Oct'82
5a 1	0-1	<1	6	14	17	0.38	0.41	0.3	1.4
	1-2	<1	--	5	12	0.50	--	0.1	1.1
5a 2	0-1	<1	7	13	16	0.74	0.47	*	2.9
	1-2	<1	--	8	13	0.74	--	*	1.5
5a 3	0-1	<1	11	15	12	1.04	0.46	*	2.0
	1-1.5	<1	--	15	12	0.63	--	*	1.1
5a 4	0-1	<1	8	9	12	1.00	2.16	*	2.1
	1-2	<1	--	--	7.9	0.50	--	--	1.3
5b 1	0-1	<1	8	11	15	0.52	0.19	--	2.0
	1-2	<1	--	4	13	0.57	--	0.1	0.6
	2-2.5	<1	--	3	12	0.34	--	0.1	0.8
5b 2	0-1	<1	8	11	66	2.01	0.86	--	2.5
	1-2	--	--	2	15	--	--	--	1.5
5b 3	0-1	<1	5	9	16	1.20	0.17	*	2.2
	1-2	<1	--	4	5.6	0.62	--	0.1	1.4
	2-2.5	<1	--	--	2.0	1.36	--	--	1.5
5b 4	0-1	<1	3	9	15	0.51	0.16	0.3	1.9
	1-2	<1	--	2	10	0.67	--	0.1	1.1
	2-2.5	<1	--	--	6.0	0.55	--	--	0.9
5c 1	0-1	<1	10	7	8.3	0.28	1.63	<0.1	0.7
	1-2	<1	--	3	2.2	0.23	--	<0.1	0.4
5c 2	0-1	<1	2	7	12	0.44	0.10	0.2	1.5
	1-2	<1	--	2	3.8	0.27	--	0.1	0.6
5c 3	0-1	<1	3	6	7.8	0.39	0.08	1.0	0.8
	1-2	<1	--	3	3.2	0.29	--	0.2	0.6
5c 4	0-1	<1	8	7	9.1	0.20	1.37	0.2	0.8
	1-2	<1	--	1	4.5	0.24	--	<0.1	0.6

TABLE 5.2-2 Values of exchangeable sodium percentage (ESP), and boron (ppm) from soil samples. (Continued)

Treatment # and Replication #	Depth Interval in Feet	ESP (%)				Boron (ppm)			
		June	Dec	Oct'81	Oct'82	June	Dec	Oct'81	Oct'82
7c 1	0-1	<1	7	7	7.8	0.54	0.33	0.7	0.8
	1-1.5	<1	--	3	5.2	0.62	--	0.4	0.7
7c 2	0-1	<1	--	5	9.1	0.57	--	0.7	1.5
	1-1.5	<1	--	--	12	0.78	--	--	2.8
7c 3	0-1	<1	--	6	8.4	0.74	--	0.9	3.6
	1-2	15	--	--	25	4.43	--	--	5.7
7c 4	0-1	4	2	8	14	0.80	0.10	--	1.6
	1-2	12	--	--	7.2	1.44	--	--	1.2
Control 1	0-1	--	--	<1	5.4	--	--	< 0.1	1.1
Control 2	0-1	--	--	<1	3.9	--	--	< 0.1	1.2
	1-2	--	--	<1	1.4	--	--	< 0.1	0.9
Control 3	0-1	--	--	1	1.2	--	--	< 0.1	0.8
	1-2	--	--	<1	1.4	--	--	< 0.1	0.8
Control 4	0-1	--	--	6	1.9	--	--	< 0.1	0.5
	1-2	--	--	3	1.1	--	--	< 0.1	1.1

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[*] Colored extract could not analyze for boron.

Soil toxicity levels for each parameter are listed in Table 5.2-3. 2) Are 1982 levels less than 1981 levels? Since irrigation has ceased for a year, the levels would be expected to decrease. 3) Is there a difference between the 1982 levels of the treatment plots and the control plots? When treatment areas are compared to control areas for the same year some control over the environmental variability (such as climatic conditions) is achieved. When post-treatment levels are compared to pre-treatment levels there is no control over environmental variability. No comparison of post-irrigation to pre-irrigation levels was done. The 1982 levels which were significantly less than toxic levels, significantly less than 1981 levels, and treatment levels which were significantly different from control levels are presented in Table 5.2-4.

Results of the soil sample analysis are as follows:

-pH: The 1982 levels for all treatments are significantly less than the level which may impede plant growth (9.0). The 1982 levels are also significantly less than 1981 levels. The 1982 treatment levels generally are significantly different (higher) than 1982 control levels.

-ECe: The 1982 levels for all treatments, with the exception of Treatment #7c, are significantly less than the level which may cause a slight yield reduction in the more sensitive forage crops (2.0 mmhos/cm). None of the 1982 levels are significantly less than the 1981 levels, in fact, in most cases there is a slight increase in the ECe from '81 to '82. Treatments 5a, 5b, and 7c are significantly different (higher) than the control area for the same depth intervals. Treatment 5c is not significantly different.

-ESP The 1982 levels are significantly less than the level considered to be at the range at which moderately tolerant crops can grow with little or no loss in production (20%). The 1982 levels are the highest recorded of four sampling periods. All treatments are significantly different (higher) than the control area.

-Boron: The 1982 levels, with the exception of the top foot from treatments 5a and 5b and both depths of treatment 7c, are significantly less than the level which can cause damage to sensitive crops (2.0 ppm). The 1982 levels are the highest recorded. About half the treatments and depths are not significantly different than the control area.

Chemistry of the Vegetation

The specific ions which are of concern in the vegetation and were analyzed are fluoride (F), boron (B), and sodium (Na). Three species of vegetation were sampled, including indian ricegrass (Oryzopsis hymenoides), western wheatgrass (Agropyron smithii), and big sagebrush (Artemisia tridentata). The 1982 foliar concentrations of F, B, and Na for each of these species are listed in Tables 5.2-5 through 5.2-7; comparisons with 1980 and 1981 are given in Tables 5.2-8 to -10. Here, as with the soils, three questions were asked about the 1982 data concerning the ion concentration levels in the foliage following irrigation: 1) Are 1982 concentrations less than concentrations that might be considered toxic for plant and/or toxic to herbivores grazing in the area? 2) Are 1982 concentrations different than 1981 concentrations? With the vegetation we are interested in knowing if the ion concentrations have increased or decreased from the previous year.

TABLE 5.2-3 Soil toxicity levels for pH, electrical conductivity (Ece), Boron, and exchangeable sodium percentage (ESP).

--pH:	Soil pH less than 9.0 is considered suitable for plant growth. A pH greater than 9.0 may impede plant growth (Buckman, H.O., and N.C. Brady. 1969. The Nature and Properties of Soils. Macmillan Co., New York, N.Y. 653p.).
--ECe:	ECe of less than or equal to 2.0 mmhos/cm may cause a slight yield reduction only in the more sensitive forage crops (Mass, E.V. and G.J. Hoffman. 1977. Crop Salt Tolerance--Current Assessment. J. Irrig. and Drainage Div., Amer. Soc. Civil Engr. 00: 115-134). Therefore the limit for ECe of this report is 2.0 mmhos/cm.
--Boron:	Boron concentrations greater than or equal to 2.0 ppm can cause damage to sensitive crops (Maas and Hoffman, 1977).
--ESP:	Moderately tolerant crops can grow with little or no loss in production in soils which have an ESP of 20-40. This is also the level where physical structure of the soils are too poor for good crop production (Ayers, R.S. and D.W. Westcot. 1976. Water Quality for Agriculture. Irrigation and Drainage Paper No. 29. Food and Agriculture Organization of the U.N. Publication. 97p.). Therefore the toxicity limit for ESP is set at 20%.

TABLE 5.2-4 Average of pH, electrical conductivity (ECe), exchangeable sodium percentage (ESP), and Boron of soil samples taken June and December 1980, October 1981, and October 1982.

Treatment Number	Depth (ft)	pH				ECe (mmhos/cm)				ESP (%)				Boron (ppm)			
		Jun80	Dec80	Oct81	Oct82	Jun80	Dec80	Oct81	Oct82	Jun80	Dec80	Oct81	Oct82	Jun80	Dec80	Oct81	Oct82
5a	0-1	7.7	8.4	8.7	8.0[abc]	1.0	1.1	1.9	1.7[ac]	<1	8.0	12.8	14.2[ac]	0.8	0.9	0.3	2.1[c]
	1-2	---	---	8.5	7.9[abc]	0.7	---	1.4	1.4[ac]	<1	---	9.3	11.2[ac]	0.6	---	<0.1	1.2[ac]
5b	0-1	7.8	8.3	8.7	8.0[abc]	0.9	0.8	1.2	1.4[ac]	<1	6.0	10.0	15.3[ac]	1.1	0.4	0.3	2.1[c]
	1-2	7.8	---	8.4	7.9[abc]	0.7	---	0.9	1.3[ac]	<1	---	3.0	10.9[ac]	0.6	---	<0.1	1.1[a]
	2-2.5	8.1	---	8.4	7.7[ab]	0.7	---	0.9	1.0[a]	<1	---	3.0	6.7[a]	0.8	---	---	1.1[a]
5c	0-1	7.3	8.2	8.5	8.0[abc]	0.4	1.0	0.8	0.8[a]	<1	5.8	6.8	9.3[ac]	0.3	0.8	0.5	0.9[a]
	1-2	7.8	---	8.3	7.7[ab]	0.4	---	0.8	0.7[a]	<1	---	2.3	3.4[ac]	0.3	---	0.2	0.5[ac]
7c	0-1	7.9	8.4	8.7	7.9[abc]	0.6	0.6	1.0	2.7	1.8	7.8	6.5	9.8[ac]	0.7	0.6	0.8	1.9
	1-2	8.1	---	8.6	7.7[ab]	1.1	---	1.1	2.9	7.3	---	3.0	12.3	1.8	---	0.4	2.6[c]
Control	0-1	---	---	7.9	7.5[ab]	---	---	0.8	0.7[a]	---	---	1.8	3.1[a]	---	---	<0.1	0.9[a]
	1.2	---	---	8.2	7.6[ab]	---	---	0.5	0.5[a]	---	---	1.0	1.3	---	---	<0.1	0.9[a]

[a] 1982 levels followed by an "a" are significantly less than toxic levels of respective parameter at $\alpha=0.05$ using the t Test

[b] 1982 levels followed by a "b" are significantly less than respective 1981 levels at $\alpha=0.05$ using the t Test.

[c] 1982 Treatment levels followed by a "c" are significantly different than 1982 Control levels for same depths and parameters at $\alpha=0.05$ using the t Test.

TABLE 5.2-5 Foliar concentration of Boron, Sodium, and Fluoride in Indian ricegrass (*Oryzopsis hymenoides*). October, 1982.

Treatment and Replication	Boron (ppm)	Sodium (ppm)	Fluoride (ppm)
5b 1	29	860	< 20
2	11	430	< 20
3	40	110	< 20
4	27	990	< 20
5	42	2000	< 20
6b 1	31	2200	< 20
2	25	540	< 20
3	28	3800	< 20
4	11	2200	< 20
5	<10	1900	< 20
7c 1	11	1100	< 20
2	11	1400	< 20
3	14	1800	< 20
4	13	2400	< 20
5	16	1000	< 20
Control 1	19	290	< 20
2	11	150	< 20
3	10	620	< 20
4	12	360	< 20
5	13	72	< 20

TABLE 5.2-6 Foliar concentration of Boron, Sodium, and Fluoride in Western Wheatgrass (Agropyron smithii). October, 1982.

Treatment and Replication		Boron (ppm)	Sodium (ppm)	Fluoride (ppm)
5b	1	28	190	<20
	2	11	230	<20
	3	24	420	<20
	4	24	320	<20
	5	30	130	<20
6b	1	25	200	<20
	2	17	290	<20
	3	23	200	<20
	4	10	260	<20
	5	11	250	<20
7c	1	12	980	<20
	2	11	1100	<20
	3	10	610	<20
	4	<10	560	<20
	5	10	590	<20
8b	1	19	130	<20
	2	<10	180	<20
	3	10	240	<20
	4	13	140	<20
	5	18	160	<20
Control	1	12	107	<20
	2	<10	45	<20
	3	18	200	<20
	4	15	230	<20
	5	13	56	<20

TABLE 5.2-7 Foliar concentrations of Boron, Sodium, and Fluoride in Big Sagebrush (Artemisia tridentata). October, 1982.

Treatment and Replication		Boron (ppm)	Sodium (ppm)	Fluoride (ppm)
5b	1	49	140	<20
	2	43	130	<20
	3	43	140	<20
	4	51	140	<20
	5	34	110	<20
6b	1	40	240	<20
	2	35	95	<20
	3	38	380	<20
	4	48	150	<20
	5	26	270	<20
7c	1	25	480	<20
	2	42	160	<20
	3	20	-	<20
	4	24	620	<20
	5	52	58	<20
8b	1	35	130	<20
	2	47	110	<20
	3	43	100	<20
	4	46	240	<20
	5	38	140	<20
Control	1	29	180	<20
	2	36	92	<20
	3	23	180	<20
	4	38	250	<20
	5	48	83	<20

TABLE 5.2-8 Average fluoride (F) concentrations in foliage of *Oryzopsis hymenoides*, *Agropyron smithii*, and *Artemisia tridentata* at the end of growing seasons 1980, 1981, and 1982.

		Fluoride (ppm)		
Species	Treatment #	1980	1981	1982[a]
Oryzopsis hymenoides	5b	10.5	22.3	<20
	6b	39.5	42.0	<20
	7c	45.7	53.8	<20
	8b	--	--	--
	control	--	17.0	<20
Agropyron smithii	5b	27.6	19.0	<20
	6b	41.4	22.9	<20
	7c	45.0	38.4	<20
	8b	32.2	26.9	<20
	control	--	23.8	<20
Artemisia tridentata	5b	8.8	13.2	<20
	6b	16.4	24.3	<20
	7c	18.0	26.9	<20
	8b	8.6	16.7	<20
	control	--	10.4	<20

[a] Fluoride toxicosis has been observed in livestock grazing western wheatgrass containing 60 ppm fluoride. (Shupe, J.L., H.B. Peterson, Arland E. Olsen, and Gene W. Miller. 1978. Effects of poisonous plants on livestock. Academic Press, Inc. New York, New York. 40 p.) Therefore, 60 ppm F is considered as the toxic concentration for fluoride in the foliage. There are several factors which influence fluoride toxicosis in grazing livestock, for more information refer to the 1981 C.B. ANNUAL REPORT VOL. 2 section 8.11.3.5. The 1982 concentrations of fluoride are well below the toxic concentration. Therefore no fluoride toxicosis would be expected in grazing animals from the irrigation area during the 1982 growing season.

TABLE 5.2-9 Average boron (B) concentrations in foliage of *Oryzopsis hymenoides*, *Agropyron smithii*, and *Artemisia tridentata* at the end of growing seasons 1980, 1981, and 1982.

		Boron (ppm)		
Species	Treatment#	1980	1981	1982
Oryzopsis hymenoides	5b	48.03	2.1	29.80[ac]
	6b	86.10	2.1	23.75[ac]
	7c	41.40	2.1	13.00[ab]
	8b	--	--	--
	control	--	2.1	13.00[a]
Agropyron smithii	5b	40.40	2.5	23.40[a]
	6b	47.90	2.1	19.00[a]
	7c	36.75	5.5	10.75[abc]
	8b	41.40	2.7	15.00[a]
	control	--	2.2	14.50[a]
Artemisia tridentata	5b	113.00	87.6	44.00[ab]
	6b	106.80	45.7	37.40[ab]
	7c	138.40	48.6	32.60[ab]
	8b	101.60	70.6	41.80[ab]
	control	--	21.6	34.80[a]

[a] 1982 concentrations were compared with known toxic concentration of B in plant foliage -- <250 ppm B causes boron leaf toxicity: Richards, L. A. (Editor). 1954. "Diagnosis and Improvements of Saline and Alkali Soils" USDA Agricultural Handbook No. 60. Those values having an "a" are significantly below toxic concentrations at α=0.05 using the t Test.

[b] 1982 concentrations were compared to 1980 concentrations (1891 values for B in *O. hymenoides* and *A. smithii* are suspect because of such low values) in order to determine if 1982 concentrations of B in foliage has changed significantly since irrigation has ceased. 1982 values having a "b" are significantly different than 1980 at α=0.05 using the t Test.

[c] 1982 values of the treatment areas were compared to 1982 values in the control areas for same species in order to determine if the concentrations of B were significantly different between the treatment areas and the control area for the same year. 1982 treatment values having a "c" are significantly different than those in the control for same species at α=0.05 using the t Test.

TABLE 5.2-10 Average sodium (Na) concentrations in foliage of *Oryzopsis hymenoides*, *Agropyron smithii*, *Artemisia tridentata*, at the end of growing seasons 1980, 1981, and 1982.

		Sodium (ppm)		
Species	Treatment #	1980	1981	1982
Oryzopsis hymenoides	5b	657.0	1628.3	878.0[a]
	6b	595.8	2186.6	2128.0[c]
	7c	661.5	1784.7	1540.0[ac]
	8b	--	--	--
	control	--	475.2	298.4[a]
Agropyron smithii	5b	455.1	354.4	258.0[a]
	6b	517.5	365.4	240.0[abc]
	7c	713.3	436.6	768.0[abc]
	8b	444.1	390.8	170.0[ab]
	control	--	212.8	127.6[a]
Artemisia tridentata	5b	663.5	214.7	132.0[a]
	6b	573.2	392.0	227.0[a]
	7c	1099.2	635.3	329.5[a]
	8b	803.4	157.4	144.0[a]
	control	--	57.9	157.0[a]

[a] 1982 concentrations were compared with known toxic concentrations of sodium in plant foliage which was found to be 10-30 meq NaCl per 100 grams or 2300-6900 ppm Na for sensitive plants (Ehlig, C.F. and L. Bernstein. 1959. Foliar Absorption of Sodium and Chloride as a Factor in Sprinkler Irrigation. Proc. Amer. Soc. Hort. Sci. 74:661-670). Those 1982 values having an "a" are significantly below toxic concentrations at $\alpha = 0.05$ using the t Test.

[b] Same as preceeding table.

[c] Same as preceeding table.

This is important because of accumulation of ions in the soil from the previous year's irrigation, prior to leaching from winter and early spring precipitation, may have been available for uptake by the vegetation. 3) Are 1982 treatment concentrations different than control area concentrations? The reasoning and justification for this question is the same as is explained for soils.

The results of the vegetation analysis are as follows:

- Fluoride: None of the species in any of the treatments exceed 20 ppm. This is well below the level where fluoride toxicosis has been observed in livestock or would be expected in wildlife (60 ppm). Chemical analysis only reported F levels as being less than 20 ppm. Therefore it is difficult to say that the 1982 levels were significantly less than 1981 levels, even though 1981 levels are close to or greater than 20 ppm in all species at all treatments.

- Boron: The 1982 concentrations for all three species and all treatments are significantly less than concentrations which can cause boron leaf toxicity (250 ppm). The 1982 levels were compared to 1980 levels, rather than 1981, because of the suspect low levels in 1981. Only the levels in big sagebrush were significantly less in 1982 than 1980. The 1982 treatment concentrations were not, for the most part, significantly different than 1982 Control area concentrations. Only treatments 5b and 6b for indian ricegrass (greater than) and treatment 7c for western wheatgrass (less than) were significantly different.

- Sodium: Only indian ricegrass in treatment 6b approached the toxicity range (2300 ppm - 6900 ppm) for Na. All other species and treatments were significantly less than the low end of the toxicity range. The 1982 levels for western wheatgrass were significantly different than 1981 levels (6b and 8b were less, 7c was greater). Indian ricegrass and big sagebrush 1982 levels were not significantly less than 1981, yet they were slightly lower. The 1982 treatment concentrations were not, for the most part, significantly different than the 1982 control areas. The exceptions to this were treatments 6b and 7c for both indian ricegrass and western wheatgrass (both were greater).

Chemical concentration in the foliage are significantly below their respective toxic limit ranges. Therefore, there should be little concern for continued plant productivity and animal consumption of the vegetation. Despite the increased concentration of sodium and boron in the soils, visual observation of the vegetation showed no signs of salt or boron damage. In fact, the concentration levels in the foliage has decreased. However, since there has been an increase in those parameters, continued visual observation of the vegetation is recommended.

The concentration of the parameters in the soil were significntly below respective toxic concentrations for most treatments. The concentrations which were considered toxic levels were for sensitive crops only. The vegetation in the irrigated area would not be considered as sensitive. Therefore, even though there was a slight increase in sodium and boron in 1982, the 1982 levels should not be of significant concern. However, as was mentioned previously, continued visual observation of the vegetation is recommended. The 1982 levels for the control area were also increased. These increases could be the result of yearly variations due to naturally occurring environmental factors such as climate. Unless visual observations of the vegetation detect salt or boron damage, future chemical analysis of the soils and vegetation should not be necessary until prior to re-use of the irrigation system.

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